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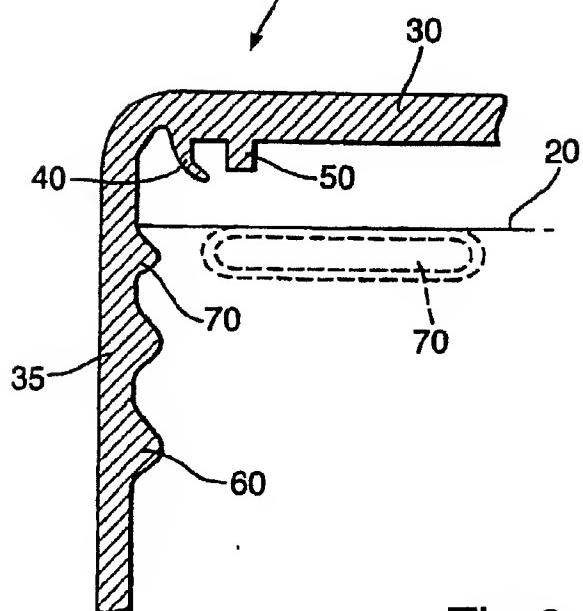
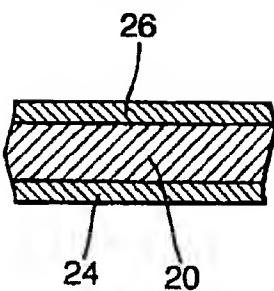
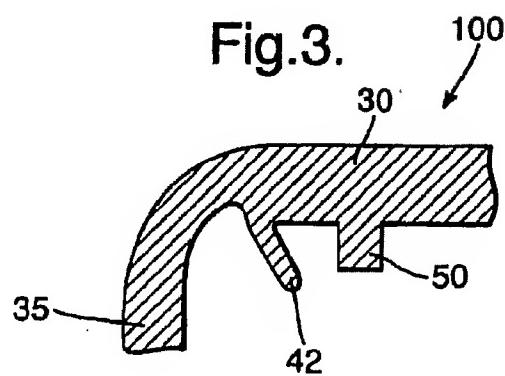
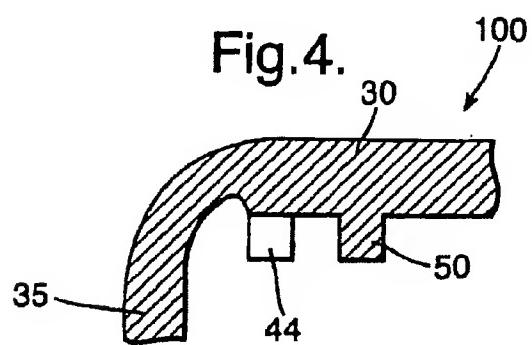
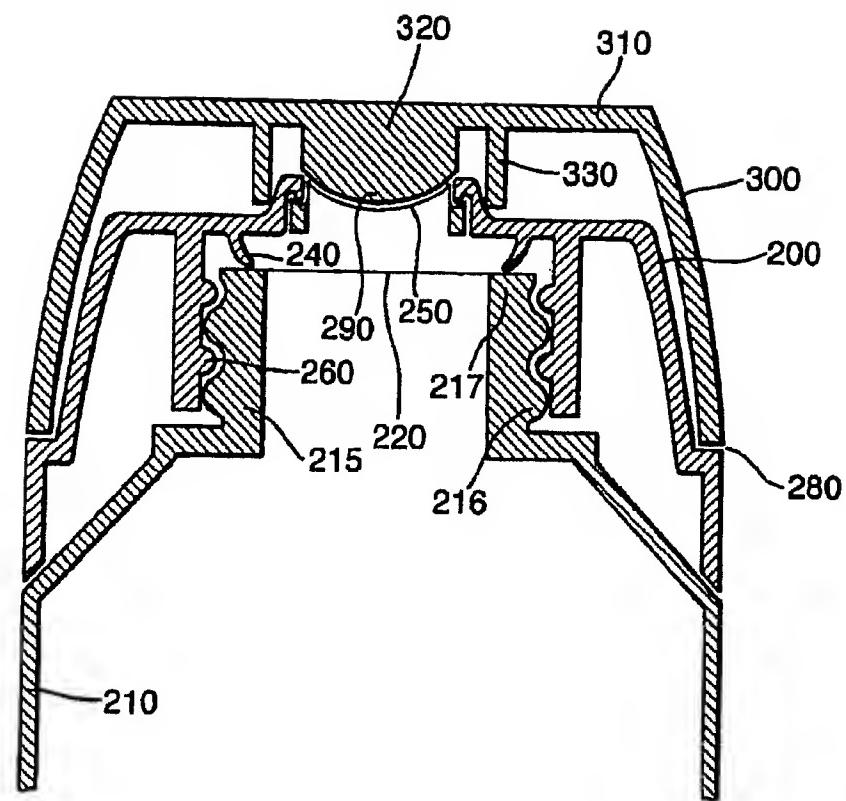
**Fig.1.****Fig.2.****Fig.3.****Fig.4.**

Fig.5.



WADLESS CLOSURE

The present invention relates to a closure, comprising a shell and a membrane, for a container and a method of sealing a container with such a closure.

5       Closures are known which comprise a membrane to be sealed to the rim of a container, overlain by a shell which protects the membrane's relatively delicate nature. Correspondingly, containers are known in association with these closures wherein a membrane has been sealed to the  
10      rim and is protected by a shell. Once the membrane is removed, the shell is then used to re-seal the container, since the shell is manufactured from a relatively good gas-tight material. This type of closure is often used for products such as coffee granules where it is  
15      necessary to have a gas-tight barrier well sealed over the container's opening to maintain shelf-life of the product. This barrier is provided by a membrane such as an aluminium foil. Once purchased, the shell is firstly removed. The foil is then also removed to allow access to  
20      the product. Since products are often not consumed all at once it is preferable that the container be closed by as good a gas-tight barrier and with as good a seal between barrier and container as possible. This is typically achieved by re-fitting the shell to the container. The  
25      shell alone is accepted as being a poorer gas-tight barrier than a well sealed membrane.

One well known closure comprises a membrane and a wad which together rest inside a shell prior to fitting to the container. The membrane and wad have an adhesive positioned between them to retain the two together. A  
30

further layer of adhesive is positioned on the side of the membrane closest to the container, when fitted. When the shell is positioned on the container it provides a closing force which applies pressure to the further layer  
5 of adhesive and to the membrane. The layer of adhesive then adheres the membrane to the rim of the container. This may be achieved by heat activation of the adhesive layer by means of induction heating. Alternatively the adhesive may be of the so-called "hot melt glue" variety  
10 which does not require further heat for activation but rather, simply adheres the membrane to the rim of the container by means of the pressure applied by the shell.

If induction heating is employed the heating may also be employed to weaken the layer of adhesive lying  
15 between the membrane and wad. This has the effect that when the shell is removed the wad remains within the shell and the membrane remains sealed and affixed to the rim of the container.

The purpose of the wad is two-fold. Firstly, it  
20 provides a cushion-effect so that an even pressure is applied from the shell to the membrane. This has the advantage that if containers are used which have inherently uneven rim surfaces, the membrane is still efficiently adhered to the rim to ensure effective  
25 sealing. Secondly, once the membrane has been removed by the user, the wad provides re-sealing qualities against the rim of the container. This is achieved by the resilient nature of the wad. The above described closure is taught in US-A-6,277,478.

A problem inherent with this type of closure is that it is relatively expensive in that a wad and a membrane are provided.

EP-A-1211180 discloses a closure which has only a membrane and no wad. To provide a sufficient force onto the membrane to seal it to the container's rim, by means of heat induction for instance, a rib is provided on the underside of the shell. This rib is present along and above the rim of the container so that the membrane is squeezed between the two during the sealing of the membrane to the rim. However, the rib is not resilient and does not provide an even force to cater for uneven rims as maybe typically found with glass containers. Accordingly, the membrane is not always perfectly sealed to the rim of the container.

Further, in some instances there is a need for the closure to be oriented on the container in a particular manner. For example, if the closure and associated container are not circular in plan. In such a situation if the closure and container are held together by screw threads then there is a possibility, due to manufacturing tolerances in the physical size and relationship of the container and closure, that the rib will not be able to provide sufficient pressure, if any, to press the membrane onto the rim of the container during induction heating. Such a situation does not typically arise where there is no orientational requirement between the closure and container since the problem may be overcome by further twisting of the closure onto the container (so-called "torquing up").

Another problem with the known rib-type closures is that since this rib is not resilient it does not provide a re-seal quality sufficient to provide a gas-tight seal to keep the product within the container fresh for a relatively long time, such as weeks or even months.

Accordingly, it would be desirable to have a closure which has only a removable membrane for providing a gas-tight barrier on manufacture, but which also has a shell with good re-sealing qualities so that after the membrane has been removed by the user, the re-seal quality is sufficient to maintain the product within the container fresh for a relatively long time. Further, it would be desirable to have a closure which provides an even pressure to a membrane so that it may be sealed effectively to the rim of an associated container.

In one aspect the present invention provides A closure for a container, the closure comprising a shell formed from a first material, and a wadless membrane, wherein the membrane is adapted to be heat sealed to a rim of a container to provide a gas-tight barrier, and wherein the shell has a downwardly extending resilient sealing element formed from a second material different from the first material for providing an even sealing pressure to the membrane during heat sealing and for providing a gas-tight re-seal once the membrane has been broken or removed.

In another aspect the present invention provides a method of sealing a container with a closure comprising the steps of moulding a shell, fixing the shell to the container wherein a wadless barrier membrane is located between the shell and the container, and adhering the membrane to a rim of the container by heat sealing,

wherein the shell comprises a resilient sealing element for providing an even sealing pressure to the membrane during heat sealing and for providing a gas-tight re-seal once the membrane has been broken or removed.

Further embodiments and features of the invention are disclosed in the dependent claims attached hereto.

The present invention and its advantages will be better understood by referring, by way of example, to the  
5 following detailed description and the attached Figures, in which:

Figure 1 shows a cross-section of a closure according to one embodiment of the invention,

10 Figure 2 shows a cross-section of a membrane according to one embodiment of the invention,

Figure 3 shows an enlarged view of a section of a closure showing one embodiment of a sealing element,

15 Figure 4 shows an enlarged view of a section of a closure showing another embodiment of a sealing element, and

Figure 5 shows a cross-sectional side view of yet another embodiment of a closure according to the present invention.

In Figure 1, a closure 100 comprises a shell 30  
20 which has a top plate and a downwardly extending skirt 35. In this specification, orientational words such as "downwardly" are used with regard to the drawings and are not meant to be limiting.

This skirt 35 has screw threads 60 positioned on the  
25 inside and projecting radially inward. These screw threads 60 interact with screw threads (not shown)

positioned on the outside of a container's neck area so as to enable the closure 100 to be screwed onto the container.

- A membrane 20 is also shown. Before being sealed to
- 5 the container the membrane 20 is placed inside the closure 100 so that it initially rests on projections 70. These projections 70 exist in an annulus around the inside of the skirt 35. They may be either in the form of a continuous annulus or a discontinuous annulus.
- 10 Alternatively, no projections 70 may be provided and the membrane 20 may just rest on the threads 60.

Membrane 20 lies on top of the container and provides a gas-tight barrier when adhered to the rim of the container. This is not only due to the seal between

15 the rim and the membrane (20) but also due to the oxygen barrier qualities of the membrane (20).

From the underside of the shell 30 a downwardly extending claw-type sealing element 40 is present in a annulus around the inside of the perimeter of the shell

20 30. Such a claw-type sealing element is known from GB-A-2,222,821.

A stop 50 downwardly extending from the underside of the shell may also be present. This stop 50 is also annular and lies around the perimeter of the shell but

25 radially inward from the claw-type sealing element 40.

The claw-type sealing element 40 is a rib which, in cross-section, tapers towards the end distal from the shell. It has a curved nature so that it gently curves radially inward. However, the sealing element 40 may also

30 curve radially outward.

During manufacture, the membrane 20 is fitted inside the shell 30 and held either by projections 70 or threads 60. The shell 30 is then fitted to the container so that the threads 60 interact to hold the two together. The  
5 shell 30 may be fitted by either being pushed over the container's mouth or by rotation. If fitted by being pushed over the container's mouth, the shell will flex slightly to allow the threads 60 on the inside of the skirt to jump or pass over the threads 70 on the outside  
10 wall of the container before resuming its initial shape to ensure that the two sets of threads engage properly.

Once in place, the resilient sealing element 40 provides a force to push the membrane onto the rim of the container. The force is evenly distributed by the  
15 resilient nature of the sealing element 40 which ensures that even when containers with uneven rims are used the membrane may be efficiently sealed to the container. Typical materials used to fabricate containers which may have uneven rim surfaces are glass and metal. In the  
20 latter case, metal containers which have welded seams often have a so-called "weld-step" on the rim which can exacerbate the unevenness.

A cross-section of one type of membrane 20 is shown in Figure 2. The membrane 20 has a layer of sealing  
25 adhesive 24 shown on its lower surface. However, this layer of adhesive 24 may be provided directly on to the rim of the container, rather than as a layer with the pre-formed membrane 20. If non-heat-activated adhesive 24 is employed the pressure provided by the sealing element  
30 40 will seal the membrane 20 to the rim of the container.

However, if heat-activated adhesive 24 is employed the combined container and closure 100 are passed through apparatus which provides heat to the adhesive layer 24. One typical method is by induction-heating of the  
5 membrane 20, which then passes heat to the adhesive layer 24 by means of conduction. In this case the membrane 20 has to have at least a partial metallic composition. However, other forms of heating the adhesive 24 are known such as direct conduction heating. In addition to heat  
10 being provided, pressure is provided by the resilient sealing element so that the combination of the heat and pressure seals the membrane 20 to the rim of the container.

The heating of the heat-activated adhesive layer 24  
15 activates its adhesive qualities so that the membrane 20 is adhered to the rim of the container, thus providing an air-tight, integral and hermetic barrier. However, the adhesive may be chosen so that the membrane may be easily peeled off from the rim of the container.

20 To aid the peeling off of the membrane a tab (not shown) may be positioned at its edge. In this case the tab may either be downwardly depending from the edge of the membrane so that it is sandwiched between the two sets of threads 60, or may be bent back on itself so that  
25 it lies on the top of the membrane. Alternatively, the tab may be positioned on top and away from the edge of the membrane 20. Another possibility is that no tab exists but rather the membrane is sized so that it is slightly larger than the outer rim of the container to

provide an edge which can be gripped by the user to aid peeling off of the membrane.

The membrane 20 may also have a layer 26 on its upper surface. This layer may comprise any combination of 5 print or lacquer and may also consist of a protective layer formed from a polymer. This layer may also be embossed.

It has been found that, contrary to expectation, the sealing element 40 is not damaged by the heating effect 10 by, for instance, permanent deformation and therefore does not lose its resilience.

Once the user removes the shell 30 and the membrane 20, in order to access the product within the container, the shell 30 is ideally re-fitted to reduce degradation 15 of the product by contact with the atmosphere. This is achieved since the shell 30 may be manufactured from a gas-tight barrier material and it is re-sealed to the rim of the container by screwing it onto the container. The re-seal effect is provided by the sealing element 40 20 interacting with the top of the rim of the container. Since the sealing element 40 is resilient it applies even pressure even onto an uneven surface such as may occur . with glass or metal containers.

Further, it should be understood that the well- 25 sealed initial membrane provides a degree of gas-tightness which is required to keep a product, on the shelf of a shop or in a warehouse, fresh for many months. Conversely, the degree of gas-tightness required after the product has been bought and opened is less since 30 typically the product is consumed within a few weeks.

Accordingly, it is accepted that the gas-tight barrier properties of a re-fitted shell are poorer than the initial well-sealed membrane. However, it has been shown that a shell with the above described resilient 5 element substantially improves the gas-tightness compared to the prior art.

To prevent over-tightening of the shell 30 with the container, a stop 50 may be provided as described above with reference to Figure 1. The rim of the container will 10 meet the underside of the stop 50 and prevent the shell 30 from moving closer to the rim of the container.

It may be arranged that the resilient sealing element 40 is pinched between the stop and the rim of the container to provide a seal.

15 In Figures 3 and 4 two further embodiments of resilient sealing elements are shown. The element 42 Figure 3 takes the form of a "finger" shape. Although shown as approximately having the same cross-section along its length it could be frusto-conical in shape.

20 Figure 4 shows an embodiment whereby a block of resilient material 44 different from the material of the rest of the closure, is formed with the material of the rest of the closure using such known methods as bi-injection moulding to produce a one-piece closure. An 25 example of such resilient material is TPE (thermo-plastic elastomer).

Another embodiment of the present invention is shown in Figure 5 and relates to closures which have to be oriented onto an associated container neck in a 30 particular way so that the closure and container lie in a

specific orientation relative to one another. Such closures and containers are known in which the cross-sectional shape is oval. However, other non-circular shapes are also contemplated. For example, shampoo or

5 shower-gel like containers are often produced wherein the closure fits onto the shoulder of the container such that there is an unbroken surface between the two. Of course, there could be reasons why container/closure combinations which are circularly shaped in plan may be required to

10 have orientational relationships. Further, such container/closure combinations can of course also be used for other products such as food products.

A container 210 is shown with a closure 200 fitted. The container has a neck portion 215 which includes

15 threads 216 on its outer radial surface. These threads 216 are for interaction with the threads 260 on the closure 200 so as to hold the two parts 200, 210 together. Although not shown, it is contemplated that the closure is not circular in plan but rather is oval. Accordingly,

20 the closure 200 can only sit correctly on the container in two positions (each 180 degrees away from the other, about an axis running through the container 210 and closure 200 through the centre of the discharge orifice 290) to produce the overall desired shape.

25 To ensure that the container 210 and closure 200 will fit together correctly and to seal the container with the closure the threads 216, 260 are carefully designed. However, due to the nature of the material used in the manufacture of the container and closure and the

30 tolerances which are inherent in such manufacturing

processes it is not possible to guarantee a gas-tight seal between the container 210 and closure 200.

By use of the above described invention this problem is overcome and it is possible to provide this gas-tight  
5 seal after filling.

This is achieved by having a downwardly depending resilient sealing element 240 which provides an even sealing pressure to a membrane 220 which is positioned across the top and over the orifice 290 of the container  
10 neck 215. This is achieved because the resilient sealing element 240 will compensate for the tolerances of the closure/container combination. In other words, the  
resilient sealing element 240 will compensate for any  
possible gap between the underside of the closure 200 and  
15 the rim 217 of the container.

The membrane 220 is positioned and then sealed across the top of the container mouth by such methods as described above, for example by heat sealing.

Once the membrane 220 is removed by the consumer,  
20 prior to the first discharge of product from the container, the resilient sealing element 240 will also provide a gas-tight re-seal, as described above, by pressing against the rim 217 of the container's mouth. Since the sealing element 240 is resilient it will  
25 compensate for the removal of the membrane 220 even though this will slightly increase the gap between the underside of the closure 200 and the top of the rim 217 of the container.

To be able to discharge product from the container  
30 the closure may simply be removed by unscrewing from the

container. Alternatively the closure could have an orifice 290 in its upper surface. This orifice 290 would then need to be sealed in a gas-tight manner to maintain the life of the product within the container 210. This 5 may be achieved in a number of different ways not all of which are shown in Figure 5.

For instance, another secondary closure device 300 could be associated with the primary closure 200. This secondary closure could be in the form of a cover 310. 10 This cover 310 could be hinged to the primary closure 200, at, for example, the point marked 280 in Figure 5. Alternatively, the secondary closure 300 could have a sliding relationship with the closure 200, or simply be completely detachable.

15 On the underside of the secondary closure 300 a simple plug could be formed which would have an interference fit with the orifice 290 to seal it thereby. Alternatively, an annulus 330 could be formed on the underside of the closure 300 which would have an 20 interference fit with the outside of the orifice 290. Of course both alternatives could be also be employed at the same time.

In one embodiment the orifice 290 may have a self-closing valve 250, such valves being well known in the 25 art, provided. These valves typically do not provide a gas-tight re-seal without some form of mechanical interaction from a lid. Accordingly, in the embodiment with such a valve 250, as shown in Figure 5, a projection 320 is formed on the underside of the cover 310. Further 30 an annulus 330, as described above, is also formed on the

underside of the cover 310. The projection 320 presses against, or at least is very close to, the valve 250 when the secondary closure 300 is in the closed position in relation to closure 200. This prevents the valve 250 from 5 opening. Further, and again when the secondary closure 300 is in the closed position in relation to the closure 200, the annulus 330 has an interference fit around the outside of the orifice 290. These two mechanical means provide a gas-tight seal. Accordingly, even when the 10 membrane 220 has been removed from the container 210 the contents of the container 210 are maintained in a gas-tight manner. This is because of the resilient sealing element 240 together with the means described above provided on the secondary closure 300.

15 Although the embodiment described above in relation to Figure 5 is shown with the closure at the top of the container it should be understood that in fact the closure could be situated at the bottom of the container.

With regard to the membrane 20, 220 in any of the 20 above described embodiments, it is possible to use aluminium foil. Such foil typically has a thickness of between 9 and 200 µm. However, other thicknesses are contemplated. Other metals and materials are also possible.

25 Although it has been described how the membrane 20, 220 is fitted inside the shell 30 prior to fitting the shell 30 to the container, it is also possible that instead the membrane is positioned over the rim of the container prior to the shell being fitted. In this case 30 the membrane 20, 220 may be sealed to the rim of the

container by external pressure and/or heat supplied by the manufacturing apparatus.

Also, the closure 100, 200 has been described as having screw threads 60, 260 which interact with 5 corresponding screw threads on the container's neck. However, screw threads are not essential since the closure 100, 200 could be snap fitted to the container by means of beads well known in the art.

Further, the membrane 20, 220 may be designed so 10 that rather than being removable by peeling it is merely broken through so that the membrane may still be in position in the vicinity of, and on top of, the rim of the container.

Further still, the type of container with which such 15 a closure 100, 200 may be used is not limited to glass, but may be of other typically used materials such as PET, polypropylene or metal such as aluminium or tin-plated steel.

Finally, the closure could be of the flip-top type.

WADLESS CLOSURECLAIMS:

1. A closure for a container, the closure comprising a shell formed from a first material, and a wadless membrane, wherein the membrane is adapted to be heat sealed to a rim of a container to provide a gas-tight barrier, and wherein the shell has a downwardly extending resilient sealing element formed from a second material different from the first material for providing an even sealing pressure to the membrane during heat sealing and for providing a gas-tight re-seal once the membrane has been broken or removed.
2. A closure according to claim 1, wherein the second material is a thermo-plastic elastomer.
3. A closure according to either of claims 1 and 2, wherein the second material is bi-injectionally moulded with the first material.
4. A closure according to any preceding claim, wherein the resilient sealing element is arranged so that when the closure is fitted to a container it presses against only the top of the rim of the container.
5. A closure according to any preceding claim, including a stop being arranged to press against the top of the rim of the container to limit the axial movement of the closure relative to the container.

6. A closure according to any preceding claim, wherein the closure is designed such that it has to be rotationally oriented to an associated container in a particular manner.
7. A closure according to any preceding claim, wherein the membrane includes a metal foil.
8. A closure according to any preceding claim, wherein the membrane is between 9 and 200 µm in thickness.
9. A closure according to any preceding claim, wherein the membrane is peelably removable.
10. A closure according to any preceding claim in combination with a container wherein said membrane is heat sealed to the rim of the container.
11. A method of sealing a container with a closure, comprising the steps of:
  - (a) moulding a shell according to any preceding claim,
  - (b) fixing the shell to the container wherein a wadless barrier membrane is located between the shell and the container, and
  - (c) adhering the membrane to a rim of the container by heat sealing.
12. A method of sealing a container according to claim 11, wherein the membrane is retained in the shell prior to being sealed to the rim of the container.

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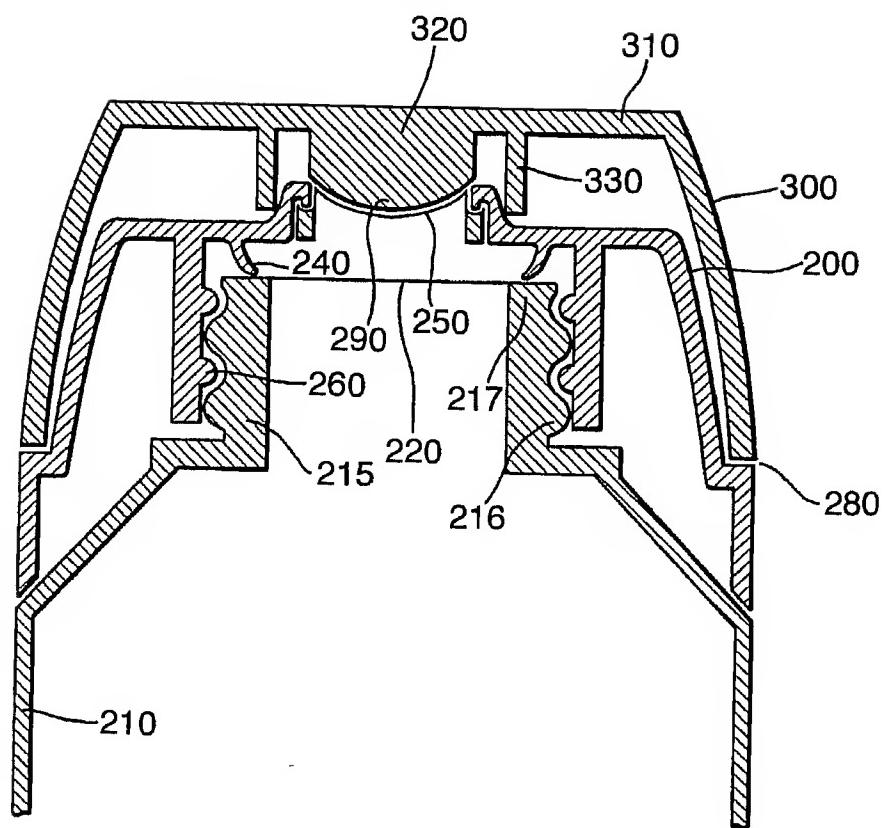
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Fig.5.



WADLESS CLOSURE

The present invention relates to a closure, comprising a shell and a membrane, for a container and a method of sealing a container with such a closure.

5       Closures are known which comprise a membrane to be sealed to the rim of a container, overlain by a shell which protects the membrane's relatively delicate nature. Correspondingly, containers are known in association with these closures wherein a membrane has been sealed to the  
10      rim and is protected by a shell. Once the membrane is removed, the shell is then used to re-seal the container, since the shell is manufactured from a relatively good gas-tight material. This type of closure is often used for products such as coffee granules where it is  
15      necessary to have a gas-tight barrier well sealed over the container's opening to maintain shelf-life of the product. This barrier is provided by a membrane such as an aluminium foil. Once purchased, the shell is firstly removed. The foil is then also removed to allow access to  
20      the product. Since products are often not consumed all at once it is preferable that the container be closed by as good a gas-tight barrier and with as good a seal between barrier and container as possible. This is typically achieved by re-fitting the shell to the container. The  
25      shell alone is accepted as being a poorer gas-tight barrier than a well sealed membrane.

One well known closure comprises a membrane and a wad which together rest inside a shell prior to fitting to the container. The membrane and wad have an adhesive  
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further layer of adhesive is positioned on the side of the membrane closest to the container, when fitted. When the shell is positioned on the container it provides a closing force which applies pressure to the further layer  
5 of adhesive and to the membrane. The layer of adhesive then adheres the membrane to the rim of the container. This may be achieved by heat activation of the adhesive layer by means of induction heating. Alternatively the adhesive may be of the so-called "hot melt glue" variety  
10 which does not require further heat for activation but rather, simply adheres the membrane to the rim of the container by means of the pressure applied by the shell.

If induction heating is employed the heating may also be employed to weaken the layer of adhesive lying  
15 between the membrane and wad. This has the effect that when the shell is removed the wad remains within the shell and the membrane remains sealed and affixed to the rim of the container.

The purpose of the wad is two-fold. Firstly, it  
20 provides a cushion-effect so that an even pressure is applied from the shell to the membrane. This has the advantage that if containers are used which have inherently uneven rim surfaces, the membrane is still efficiently adhered to the rim to ensure effective  
25 sealing. Secondly, once the membrane has been removed by the user, the wad provides re-sealing qualities against the rim of the container. This is achieved by the resilient nature of the wad. The above described closure is taught in US-A-6,277,478.

A problem inherent with this type of closure is that it is relatively expensive in that a wad and a membrane are provided.

EP-A-1211180 discloses a closure which has only a  
5 membrane and no wad. To provide a sufficient force onto the membrane to seal it to the container's rim, by means of heat induction for instance, a rib is provided on the underside of the shell. This rib is present along and above the rim of the container so that the membrane is  
10 squeezed between the two during the sealing of the membrane to the rim. However, the rib is not resilient and does not provide an even force to cater for uneven rims as maybe typically found with glass containers.  
Accordingly, the membrane is not always perfectly sealed  
15 to the rim of the container.

Further, in some instances there is a need for the closure to be oriented on the container in a particular manner. For example, if the closure and associated container are not circular in plan. In such a situation  
20 if the closure and container are held together by screw threads then there is a possibility, due to manufacturing tolerances in the physical size and relationship of the container and closure, that the rib will not be able to provide sufficient pressure, if any, to press the  
25 membrane onto the rim of the container during induction heating. Such a situation does not typically arise where there is no orientational requirement between the closure and container since the problem may be overcome by further twisting of the closure onto the container (so-  
30 called "torquing up").

Another problem with the known rib-type closures is that since this rib is not resilient it does not provide a re-seal quality sufficient to provide a gas-tight seal to keep the product within the container fresh for a 5 relatively long time, such as weeks or even months.

Accordingly, it would be desirable to have a closure which has only a removable membrane for providing a gas-tight barrier on manufacture, but which also has a shell with good re-sealing qualities so that after the membrane  
10 has been removed by the user, the re-seal quality is sufficient to maintain the product within the container  
fresh for a relatively long time. Further, it would be  
desirable to have a closure which provides an even  
pressure to a membrane so that it may be sealed  
15 effectively to the rim of an associated container.

In one aspect the present invention provides a heat sealable wadless container closure, the closure comprising a wadless membrane and a shell, wherein the membrane is adapted to be heat sealed to a rim of a  
20 container to provide a gas-tight barrier, and the shell has only a single downwardly extending resilient sealing element having a curved tapering elongate body with a base end adjacent the underside of the shell and a free end radially and axially spaced from the base end, the  
25 element arranged so that when the closure is fitted to a container the tapered free end presses against only the top of the rim of the container, to provide an even sealing pressure to the membrane during heat sealing and to provide a gas-tight re-seal once the membrane has been  
30 broken or removed, the free end of the element remaining

axially spaced from the underside of the shell when the closure is fitted to a container.

In another aspect the present invention provides a method of sealing a container with a closure comprising  
5 the steps of moulding a shell according to any of claims 1 to 7, fixing the shell to the container wherein a wadless barrier membrane is located between the shell and the container, and adhering the membrane to a rim of the container by heat sealing.

Further embodiments and features of the invention are disclosed in the dependent claims attached hereto.

10 The present invention and its advantages will be better understood by referring, by way of example, to the following detailed description and the attached Figures, in which:

Figure 1 shows a cross-section of a closure  
15 according to one embodiment of the invention,

Figure 2 shows a cross-section of a membrane according to one embodiment of the invention,

Figure 3 shows an enlarged view of a section of a closure showing one embodiment of a sealing element,

20 Figure 4 shows an enlarged view of a section of a closure showing another embodiment of a sealing element, and

Figure 5 shows a cross-sectional side view of yet another embodiment of a closure according to the present  
25 invention.

In Figure 1, a closure 100 comprises a shell 30 which has a top plate and a downwardly extending skirt 35. In this specification, orientational words such as

"downwardly" are used with regard to the drawings and are not meant to be limiting.

This skirt 35 has screw threads 60 positioned on the inside and projecting radially inward. These screw  
5 threads 60 interact with screw threads (not shown)

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positioned on the outside of a container's neck area so as to enable the closure 100 to be screwed onto the container.

- A membrane 20 is also shown. Before being sealed to  
5 the container the membrane 20 is placed inside the closure 100 so that it initially rests on projections 70. These projections 70 exist in an annulus around the inside of the skirt 35. They may be either in the form of a continuous annulus or a discontinuous annulus.  
10 Alternatively, no projections 70 may be provided and the membrane 20 may just rest on the threads 60.

Membrane 20 lies on top of the container and provides a gas-tight barrier when adhered to the rim of the container. This is not only due to the seal between  
15 the rim and the membrane (20) but also due to the oxygen barrier qualities of the membrane (20).

From the underside of the shell 30 a downwardly extending claw-type sealing element 40 is present in a annulus around the inside of the perimeter of the shell  
20 30. Such a claw-type sealing element is known from GB-A-2,222,821.

A stop 50 downwardly extending from the underside of the shell may also be present. This stop 50 is also annular and lies around the perimeter of the shell but  
25 radially inward from the claw-type sealing element 40.

The claw-type sealing element 40 is a rib which, in cross-section, tapers towards the end distal from the shell. It has a curved nature so that it gently curves radially inward. However, the sealing element 40 may also  
30 curve radially outward.

During manufacture, the membrane 20 is fitted inside the shell 30 and held either by projections 70 or threads 60. The shell 30 is then fitted to the container so that the threads 60 interact to hold the two together. The  
5 shell 30 may be fitted by either being pushed over the container's mouth or by rotation. If fitted by being pushed over the container's mouth, the shell will flex slightly to allow the threads 60 on the inside of the skirt to jump or pass over the threads 70 on the outside  
10 wall of the container before resuming its initial shape to ensure that the two sets of threads engage properly.

Once in place, the resilient sealing element 40 provides a force to push the membrane onto the rim of the container. The force is evenly distributed by the  
15 resilient nature of the sealing element 40 which ensures that even when containers with uneven rims are used the membrane may be efficiently sealed to the container. Typical materials used to fabricate containers which may have uneven rim surfaces are glass and metal. In the  
20 latter case, metal containers which have welded seams often have a so-called "weld-step" on the rim which can exacerbate the unevenness.

A cross-section of one type of membrane 20 is shown in Figure 2. The membrane 20 has a layer of sealing  
25 adhesive 24 shown on its lower surface. However, this layer of adhesive 24 may be provided directly on to the rim of the container, rather than as a layer with the pre-formed membrane 20. If non-heat-activated adhesive 24 is employed the pressure provided by the sealing element  
30 40 will seal the membrane 20 to the rim of the container.

However, if heat-activated adhesive 24 is employed the combined container and closure 100 are passed through apparatus which provides heat to the adhesive layer 24. One typical method is by induction-heating of the  
5 membrane 20, which then passes heat to the adhesive layer 24 by means of conduction. In this case the membrane 20 has to have at least a partial metallic composition. However, other forms of heating the adhesive 24 are known such as direct conduction heating. In addition to heat  
10 being provided, pressure is provided by the resilient sealing element so that the combination of the heat and pressure seals the membrane 20 to the rim of the container.

The heating of the heat-activated adhesive layer 24  
15 activates its adhesive qualities so that the membrane 20 is adhered to the rim of the container, thus providing an air-tight, integral and hermetic barrier. However, the adhesive may be chosen so that the membrane may be easily peeled off from the rim of the container.

20 To aid the peeling off of the membrane a tab (not shown) may be positioned at its edge. In this case the tab may either be downwardly depending from the edge of the membrane so that it is sandwiched between the two sets of threads 60, or may be bent back on itself so that  
25 it lies on the top of the membrane. Alternatively, the tab may be positioned on top and away from the edge of the membrane 20. Another possibility is that no tab exists but rather the membrane is sized so that it is slightly larger than the outer rim of the container to

provide an edge which can be gripped by the user to aid peeling off of the membrane.

The membrane 20 may also have a layer 26 on its upper surface. This layer may comprise any combination of 5 print or lacquer and may also consist of a protective layer formed from a polymer. This layer may also be embossed.

It has been found that, contrary to expectation, the sealing element 40 is not damaged by the heating effect 10 by, for instance, permanent deformation and therefore does not lose its resilience.

Once the user removes the shell 30 and the membrane 20, in order to access the product within the container, the shell 30 is ideally re-fitted to reduce degradation 15 of the product by contact with the atmosphere. This is achieved since the shell 30 may be manufactured from a gas-tight barrier material and it is re-sealed to the rim of the container by screwing it onto the container. The re-seal effect is provided by the sealing element 40 interacting with the top of the rim of the container. Since the sealing element 40 is resilient it applies even pressure even onto an uneven surface such as may occur with glass or metal containers.

Further, it should be understood that the well- 25 sealed initial membrane provides a degree of gas-tightness which is required to keep a product, on the shelf of a shop or in a warehouse, fresh for many months. Conversely, the degree of gas-tightness required after the product has been bought and opened is less since 30 typically the product is consumed within a few weeks.

Accordingly, it is accepted that the gas-tight barrier properties of a re-fitted shell are poorer than the initial well-sealed membrane. However, it has been shown that a shell with the above described resilient 5 element substantially improves the gas-tightness compared to the prior art.

To prevent over-tightening of the shell 30 with the container, a stop 50 may be provided as described above with reference to Figure 1. The rim of the container will 10 meet the underside of the stop 50 and prevent the shell 30 from moving closer to the rim of the container.

It may be arranged that the resilient sealing element 40 is pinched between the stop and the rim of the container to provide a seal.

15 In Figures 3 and 4 two further embodiments of resilient sealing elements are shown. The element 42 Figure 3 takes the form of a "finger" shape. Although shown as approximately having the same cross-section along its length it could be frusto-conical in shape.

20 Figure 4 shows an embodiment whereby a block of resilient material 44 different from the material of the rest of the closure, is formed with the material of the rest of the closure using such known methods as bi-injection moulding to produce a one-piece closure. An 25 example of such resilient material is TPE (thermo-plastic elastomer).

Another embodiment of the present invention is shown in Figure 5 and relates to closures which have to be oriented onto an associated container neck in a 30 particular way so that the closure and container lie in a

specific orientation relative to one another. Such closures and containers are known in which the cross-sectional shape is oval. However, other non-circular shapes are also contemplated. For example, shampoo or

5 shower-gel like containers are often produced wherein the closure fits onto the shoulder of the container such that there is an unbroken surface between the two. Of course, there could be reasons why container/closure combinations which are circularly shaped in plan may be required to

10 have orientational relationships. Further, such container/closure combinations can of course also be used for other products such as food products.

A container 210 is shown with a closure 200 fitted. The container has a neck portion 215 which includes

15 threads 216 on its outer radial surface. These threads 216 are for interaction with the threads 260 on the closure 200 so as to hold the two parts 200,210 together. Although not shown, it is contemplated that the closure is not circular in plan but rather is oval. Accordingly,

20 the closure 200 can only sit correctly on the container in two positions (each 180 degrees away from the other, about an axis running through the container 210 and closure 200 through the centre of the discharge orifice 290) to produce the overall desired shape.

25 To ensure that the container 210 and closure 200 will fit together correctly and to seal the container with the closure the threads 216, 260 are carefully designed. However, due to the nature of the material used in the manufacture of the container and closure and the

30 tolerances which are inherent in such manufacturing

processes it is not possible to guarantee a gas-tight seal between the container 210 and closure 200.

By use of the above described invention this problem is overcome and it is possible to provide this gas-tight seal after filling.

This is achieved by having a downwardly depending resilient sealing element 240 which provides an even sealing pressure to a membrane 220 which is positioned across the top and over the orifice 290 of the container neck 215. This is achieved because the resilient sealing element 240 will compensate for the tolerances of the closure/container combination. In other words, the resilient sealing element 240 will compensate for any possible gap between the underside of the closure 200 and the rim 217 of the container.

The membrane 220 is positioned and then sealed across the top of the container mouth by such methods as described above, for example by heat sealing.

Once the membrane 220 is removed by the consumer, prior to the first discharge of product from the container, the resilient sealing element 240 will also provide a gas-tight re-seal, as described above, by pressing against the rim 217 of the container's mouth. Since the sealing element 240 is resilient it will compensate for the removal of the membrane 220 even though this will slightly increase the gap between the underside of the closure 200 and the top of the rim 217 of the container.

To be able to discharge product from the container the closure may simply be removed by unscrewing from the

container. Alternatively the closure could have an orifice 290 in its upper surface. This orifice 290 would then need to be sealed in a gas-tight manner to maintain the life of the product within the container 210. This 5 may be achieved in a number of different ways not all of which are shown in Figure 5.

- For instance, another secondary closure device 300 could be associated with the primary closure 200. This secondary closure could be in the form of a cover 310. 10 This cover 310 could be hinged to the primary closure 200, at, for example, the point marked 280 in Figure 5. Alternatively, the secondary closure 300 could have a sliding relationship with the closure 200, or simply be completely detachable.
- 15 On the underside of the secondary closure 300 a simple plug could be formed which would have an interference fit with the orifice 290 to seal it thereby. Alternatively, an annulus 330 could be formed on the underside of the closure 300 which would have an 20 interference fit with the outside of the orifice 290. Of course both alternatives could be also be employed at the same time.
- In one embodiment the orifice 290 may have a self-closing valve 250, such valves being well known in the 25 art, provided. These valves typically do not provide a gas-tight re-seal without some form of mechanical interaction from a lid. Accordingly, in the embodiment with such a valve 250, as shown in Figure 5, a projection 320 is formed on the underside of the cover 310. Further 30 an annulus 330, as described above, is also formed on the

underside of the cover 310. The projection 320 presses against, or at least is very close to, the valve 250 when the secondary closure 300 is in the closed position in relation to closure 200. This prevents the valve 250 from 5 opening. Further, and again when the secondary closure 300 is in the closed position in relation to the closure 200, the annulus 330 has an interference fit around the outside of the orifice 290. These two mechanical means provide a gas-tight seal. Accordingly, even when the 10 membrane 220 has been removed from the container 210 the contents of the container 210 are maintained in a gas-tight manner. This is because of the resilient sealing element 240 together with the means described above provided on the secondary closure 300.

15        Although the embodiment described above in relation to Figure 5 is shown with the closure at the top of the container it should be understood that in fact the closure could be situated at the bottom of the container.

With regard to the membrane 20, 220 in any of the 20 above described embodiments, it is possible to use aluminium foil. Such foil typically has a thickness of between 9 and 200 µm. However, other thicknesses are contemplated. Other metals and materials are also possible.

25        Although it has been described how the membrane 20, 220 is fitted inside the shell 30 prior to fitting the shell 30 to the container, it is also possible that instead the membrane is positioned over the rim of the container prior to the shell being fitted. In this case 30 the membrane 20, 220 may be sealed to the rim of the

container by external pressure and/or heat supplied by the manufacturing apparatus.

Also, the closure 100, 200 has been described as having screw threads 60, 260 which interact with 5 corresponding screw threads on the container's neck. However, screw threads are not essential since the closure 100, 200 could be snap fitted to the container by means of beads well known in the art.

Further, the membrane 20, 220 may be designed so 10 that rather than being removable by peeling it is merely broken through so that the membrane may still be in position in the vicinity of, and on top of, the rim of the container.

Further still, the type of container with which such 15 a closure 100, 200 may be used is not limited to glass, but may be of other typically used materials such as PET, polypropylene or metal such as aluminium or tin-plated steel.

Finally, the closure could be of the flip-top type.  
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CLAIMS:

1. A heat sealable wadless container closure, the closure comprising a wadless membrane and a shell,  
5 wherein the membrane is adapted to be heat sealed to a rim of a container to provide a gas-tight barrier, and the shell has only a single downwardly extending resilient sealing element having a curved tapering elongate body with a base end adjacent the underside of the shell and a free end radially and axially spaced from the base end, the element arranged so that when the closure is fitted to a container the tapered free end presses against only the top of the rim of the container, to provide an even sealing pressure to the membrane during heat sealing and to provide a gas-tight re-seal once the membrane has been broken or removed, the free end of the element remaining axially spaced from the underside of the shell when the closure is fitted to a container.
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4. A closure according to any preceding claim, wherein the membrane includes a metal foil.
5. A closure according to any preceding claim, wherein the membrane is between 9 and 200 µm in thickness.
6. A closure according to any preceding claim, wherein the membrane is peelably removable.
7. A closure according to any preceding claim, wherein the sealing element is a claw-type sealing element.
8. A closure according to any preceding claim in combination with a container wherein said membrane is heat sealed to the rim of the container.
9. A method of sealing a container with a closure, comprising the steps of:
  - (a) moulding a shell according to any preceding claim,
  - (b) fixing the shell to the container wherein a wadless barrier membrane is located between the shell and the container, and
  - (c) adhering the membrane to a rim of the container by heat sealing.
10. A method of sealing a container according to claim 8, wherein the membrane is retained in the shell prior to being sealed to the rim of the container.

11. A closure substantially as hereinbefore described with reference to, and as shown in, Figures 1, 3, 4 and 5.

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# PATENT SPECIFICATION

(11) 1 473 482

- 1473482**
- (21) Application No. 3201/75 (22) Filed 24 Jan. 1975  
 (31) Convention Application No. 7402483  
 (32) Filed 25 Jan. 1974 in  
 (33) France (FR)  
 (44) Complete Specification published 11 May 1977  
 (51) INT CL<sup>2</sup> B65D 41/34  
 (52) Index at acceptance  
 B8T 20B 2B1A 2C  
 B8D 65B5B



(54) A CLOSED RECEPTACLE PROVIDED WITH A SECURITY DEVICE

(71) We, LE BOUCHAGE MECANIQUE (L.B.M.) a Body Corporate organised under the laws of the French Republic, of 6, rue Anatole de la Forge, 75017 Paris, France, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

There is known a large number of security devices intended to prevent fraudulent introduction of a liquid into a receptacle which initially contains a drink such as wine or liquor, of which the origin is guaranteed by a label or trade mark.

Such security devices are often formed by an assembly of elements (valve, seating, cover member) maintained on the neck of the receptacle by a sleeve of plastics material such as polyethylene, the sleeve being itself strongly held on the neck by means such as notches and grooves.

These security devices may be covered with a cap or closure of which the function is at the same time to indicate, after the first opening of the receptacle, that the receptacle has been opened, and to prevent any fraudulent manipulation of the sleeve with the intention of interfering with the security device.

In general these closures have a line of weakening situated above a line of mounting on the sleeve. Thus at the time of first opening of the receptacle which is generally achieved by unscrewing of the upper part of the closure, the latter is broken along the line of weakening.

The lower portion of the closure remains mounted on the sleeve and consequently is resistant to manipulations designed to remove the sleeve in order to interfere with the valve.

Unfortunately because of the relative elasticity of the plastics material forming the sleeve and also the usual manufacturing tolerances of bottles, it cannot be excluded that by exercising a strong axial force on the sleeve, it is possible to separate the latter from the neck without damaging the

part of the closure which remains mounted on the sleeve; this detracts from the absolute character of the guarantee. 50

According to the invention there is provided a closed receptacle comprising a neck terminating in a mouth, the neck being provided with a security device to prevent refilling of the receptacle, a sleeve surrounding the end of the neck adjacent the mouth and security device, and a closure comprising a skirt surrounding the sleeve and a portion of the neck below the sleeve, the skirt being provided with an upper line of weakness around the sleeve to be broken when the receptacle is first opened and a lower line of weakness adjacent the lower edge of the sleeve, the skirt being attached to the sleeve between the lines of weakness and to the neck below the lower line of weakness. The closure may be mounted to the sleeve and neck by crimping. 55

It is not possible, or at least very difficult, to remove the sleeve which contains the device rendering the receptacle unrefillable. If it is attempted however to separate the sleeve from the bottle, the second line of weakening is necessarily broken which allows such fraudulent manipulation to be detected. 60

An embodiment of the invention will be described by way of example with reference to the accompanying drawings, in which: 65

Figure 1 is an elevation of a closure before mounting on the sleeve and neck of a bottle, 70

Figure 2 is an elevation of the closure of Figure 1 after mounting on the sleeve and on the neck of the bottle, and 75

Figure 3 is a half section of the closure of Figure 2 after mounting and showing a valve device within the sleeve intended to prevent fraudulent refilling of the bottle. 80

After application of the closure to the bottle, the bottle with the closure of Figure 1, is distinguished from a bottle with the usual type of closure by the presence of two lines of weakening indicated by 1 and 2 respectively. In this embodiment these lines 85

of weakening are formed by perforations of the wall of the closure separated by narrow bridges of material.

After closure, see Figure 2, the appearance of the closure of Figure 1 is modified by the presence of a screw thread 3 corresponding to that of the sleeve and by lines of crimping 4 and 5 in the neighbourhood of and below the lines of weakening 1 and 2.

The function of such a closure will be better understood with reference to Figure 3.

This Figure shows, in section, the neck 6 of a bottle on which is mounted an anti-fraudulent refilling valve device.

This device comprises a seating 7 mounted on the neck cooperating with a valve 8 above which is a cup 9 intended to prevent access to the valve from above. This cup is provided with ports 10 intended to allow flow of the liquid contained in the bottle at the moment of pouring. The assembly of these elements is held on the upper part of the neck of the bottle by a sleeve of plastics material 11 which is securely fixed on the neck. The wall thickness of the sleeve exceeds that of the cup 9. In the construction shown in Figure 3 the sleeve is secured by the penetration of a projection 12 on the neck 6 into a groove 13 provided at the base of the sleeve 11 on its internal wall.

This assembly is covered by the closure shown in Figures 1 and 2 of which the skirt is sufficiently long to descend below the lower part of the sleeve 11. This closure is crimped around the sleeve and within groove 14, at 4, below the line of perforations 1, and within groove 15 in the neck, at 5, below the line of perforations 2.

At the time of application of the closure to the neck there is also applied by means of rollers screw threading 3 in the wall of the closure above the line of weakening 1, this screw threading corresponding to screw threading 16 provided on the external wall of the sleeve at its upper part.

An impervious sealing disc or cap 17 is held on the upper end of the sleeve by the base 18 of the closure.

On first opening the upper part of the closure, the bridges of the line of weakening 1 are broken which allows the bottle to be opened and the contents to be discharged. However it is impossible to

have access to the valve which is protected by the bowl 9 so that it is not possible to reintroduce a liquid into the bottle.

If it is attempted to remove the sleeve by pressing on the engagement of the groove 13 of the sleeve with the projection 12 of the neck, the bridges of the second line of weakening 2 are torn so that the lower part of the closure below this line is retained on the neck by the crimping 5.

#### WHAT WE CLAIM IS:—

1. A closed receptacle comprising a neck terminating in a mouth, the neck being provided with a security device to prevent refilling of the receptacle, a sleeve surrounding the end of the neck adjacent the mouth and security device, and a closure comprising a skirt surrounding the sleeve and a portion of the neck below the sleeve, the skirt being provided with an upper line of weakness around the sleeve to be broken when the receptacle is first opened and a lower line of weakness adjacent the lower edge of the sleeve, the skirt being attached to the sleeve between the lines of weakness and to the neck below the lower line of weakness.

2. A receptacle according to Claim 1, in which the skirt is attached to the sleeve and neck by crimping.

3. A receptacle according to Claim 1 or Claim 2, in which the sleeve and neck are each provided with a groove at the respective locations at which the skirt is attached.

4. A receptacle according to Claim 1, 2 or 3, in which the upper end of the sleeve is externally screw-threaded and a corresponding screw-thread is applied to the upper portion of the skirt.

5. A receptacle according to Claim 1, substantially as hereinbefore described with reference to Figure 3 of the accompanying drawings.

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1 SHEET

COMPLETE SPECIFICATION  
*This drawing is a reproduction of  
the Original on a reduced scale*

FIG.1

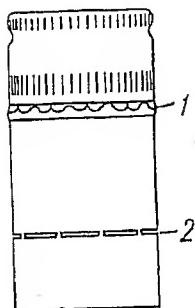


FIG.2

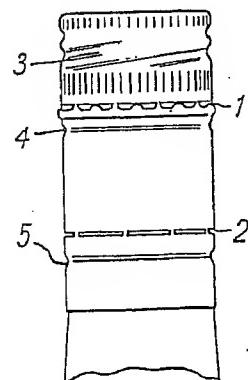
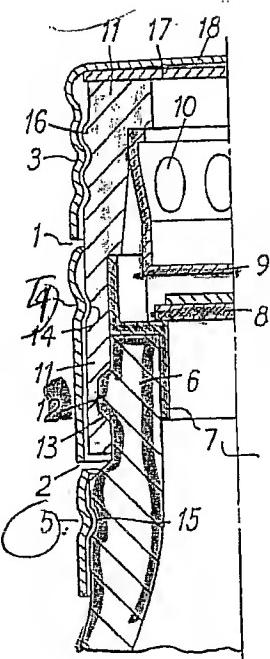


FIG.3



# PATENT SPECIFICATION

(11)

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D.J.

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- (21) Application No. 22673/75      (22) Filed 23 May 1975
- (31) Convention Application No. 2 435 337
- (32) Filed 23 July 1974 in
- (33) Fed. Rep. of Germany (DT)
- (44) Complete Specification published 1 Sept. 1977
- (51) INT. CL.: B65D 55/02
- (52) Index at acceptance

B8T 3B 9A

(19)



## (54) CHILD-PROOF CLOSURE

(71) We, NOVA-HANDELS AG, a Swiss Company of Josefstrasse 84, CH-8031 Zurich, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to the provision of a child-proof closure.

10      Closures for containers especially bottles are mass production items which require low cost manufacturing measures. The present invention is intended to provide for such closures in a way that children, according to existing and future legal prescriptions, cannot open these closures, whereas there is only a minimum rise in manufacturing costs.

20      According to the present invention we provide a child-proof closure for a container comprising a first part formed as a sleeve intended to be fixed in position on the container and a second part formed as a lid adapted to close an upper open end of the sleeve, at least one of the parts of the closure being made of elastically deformable material, the sleeve and lid having interlocking parts which, when the lid is in its closed position interlock with one another so that the sleeve cannot be opened by a simple upward movement of the lid, disengagement of the interlocking parts to permit opening of the lid being effected by squeezing.

30      Preferably the sleeve and the lid have interlocking parts which, in the closed position, engage at the end of one of the diameters of the parts i.e. an interlocking diameter in such a way, that they disengage when one of the parts is squeezed either 40 along the interlocking diameter or along a force diameter displaced therefrom.

45      In this specification we refer to diameters and to an oval deformation and these terms have been chosen in order to create simple definitions and also, because very important applications of the invention comprise normally circular closures. This, of course, does not exclude closures which are otherwise shaped, e.g. ovally or polygonally. Due to 50 the fact, that the closure has to be deformed ovally during the operation of opening,

small children do not have access to the contents of the container; primarily, because children below a certain age are unable to exercise movements, the direction of which are not congruent with the direction of opening or to exercise acts, the reason of which they do not yet understand, both simultaneously with the opening operation itself; secondly, because, these children lack the strength to deform the lids properly. The interlocking parts may be placed at both ends of the interlocking diameter and the closure may consist of a sleeve part and a separate screw or push-on lid.

55      Another possibility is to provide interlocking parts only at one end of the interlocking diameter, the other end of the interlocking diameter bearing a hinge. This design is a one-piece-closure with a hinge action lid.

60      Depending on the design and the situation of the interlocking parts, there is a multitude of variations in the closure design. Two diametrically opposed examples are, one in which there is a 90° angle between the interlocking diameter and the diameter which receives the deforming force and the other in which the two diameters coincide.

65      Both examples can be realised by a design representing a closure which is very easy to manufacture. If it is provided with a push-on lid, the sleeve may have two hooks which protrude outwardly and the lid may have corresponding openings, and in order

70      to unlock, the force can be exercised on the lid. In that case, there is preferably an angle of 90° between the interlocking diameter and force diameter. The interlocking diameter increases until the openings get free from the protruding hooks. It is also possible to exercise the force on the sleeve,

75      in which case the force will work on the interlocking diameter itself and consequently, this diameter shrinks until the protruding hooks have left the openings in an inward direction. Hinged closures can be advantageously designed in which case the deforming force does not work exactly on a diameter but on two force radii which include an obtuse angle  $2\alpha$ , the resulting force being directed away from the hinge

facilities the unlocking in addition to the oval deformation.

The oval deformation may be facilitated by providing more wall strength at the ends 5 of the force diameter or the force radiiuses than at the ends of the interlocking diameter.

The drawings show by way of example 10 embodiments of the invention.

Figure 1 is an axial section through one 15 design of the closure;

Figure 2 shows the sleeve of this closure in plan seen from above;

Figure 3 shows the lid of this closure in 20 plan seen from above;

Figure 4 is a side-view of the lid of this 25 closure, seen from the right or the left side of figure 3;

Figures 5 and 7 are side views of other 30 embodiments of the child proof closure; and

Figure 6 is a view from above on a part 35 of the opened closure of figure 5, mainly showing the inside of the lid.

As illustrated in Figures 1 to 4 the sleeve 40 3 of the closure fits on the neck 1 of a container and can be secured in position in different ways, e.g. by glueing, welding, screwing or other means, a snap-on securing means being shown. The sleeve 3 has a dispensing tube 5, and at diametrically opposed positions on its outer surface an outwardly protruding hook 7 is situated.

A lid 9 has a sealing bung in the form 45 of a ring 11 which co-operates with the outer-end of the dispensing tube 5 and two locking assemblies 13 are situated at diametrically opposed positions of the lid (figures 3 and 4), the assemblies each being formed as an aperture 17 within a protruding radial flange 15 which can be clearly 50 seen in figure 3. Furthermore (figure 4) the lid has two openings 21 in its periphery 19 directly above the flanges 15 so that the openings 17 and 21 are not separated. As shown in figure 1, lid 9 is positioned upon the sleeve 3, both hooks 7 on the sleeve 3 entering into the openings 17 and 21 on the lid 9.

On the lid the line 23 in Figure 3 indicates what we call the interlocking diameter 55 because of the interlocking parts at its ends. The dotted line 24 in Figure 3 indicates what we call the force diameter which, in this case forms a 90° angle with the interlocking diameter. If the thumb and index finger 60 of a user apply inwardly directed force in the direction of the arrows along the force diameter 24 when the lid is in its closed position, the lid will consequently be deformed into an oval in a way shown in dotted lines in figure 3. The lid lengthens 65 in the direction of the interlocking diameter 23 so that both locking assemblies 13 move outwardly to free the hooks 7 and the lid can then be opened by movement away from the sleeve.

The lid has a skirt which has two finger rests 26 which can be provided with ribs, indicating where to press. Another method of opening the closure is mainly by deformation of the sleeve in which case the part of the sleeve 3 which carries the hooks 7 can e.g. be so designed that hooks and sleeve may be elastically and regularly compressed in relation to a mouth part 27 and a lower retaining part 28 of the sleeve. In this case the force diameter and the interlocking diameter are one and the same and both carry the reference 25 as in Figure 2.

Figures 5 and 6 show a closure according 70 to the invention with a hinge 30, which links the lid to the sleeve. Parts, equivalent or similar to the previous examples, carry the same numbers occasionally marked by an apostrophe. This applies also to a closure according to figure 7 which, however, shows a snap hinge 36, 37 which locks the lid 9' in its open or closed position by spring force. These closures have only one hook 7 and one locking assembly 13. The finger rests 26' are not positioned exactly at the ends of a diameter, but they are positioned a little more towards the hinge as in figure 6. The middle of the finger rests enclose together with a radius through the eye hole an angle  $\alpha$  which is larger than 90°, the preferred size of the angle  $\alpha$  being between 80 100° and 120°.

This design does not show a force diameter and we call the two directions of the applied finger force the "force radiiuses". 85 The resulting force radiiuses in figure 6 carry the reference number 24'. The forces exercised by the fingers of a user are effective in the direction of the force radiiuses 24' inwardly to produce a force component in 90 the direction of arrow 34. The counter force of this force component is exercised by a hand, which lays on the sleeve part 3', via the hinge 30. Consequently this closure deforms nearly exclusively in the direction 105 of the arrow 34 which very effectively facilitates an opening operation. A lid which is deformed as described is shown in figure 110 6 by a dotted line.

The oval deformation of lid 9' is facilitated 115 by weakening the skirt 19' at the ends of interlocking diameter 23 in relation to the ends of the force radiiuses (figure 6). This applies accordingly to the lid 9 in figure 3. The skirt 19 shows its greatest strength at 120 the ends of force diameter 24.

Instead of the examples shown in the drawings with one or two outwardly protruding hooks on the sleeve it is also possible to provide inwardly protruding hooks on the 125 sleeve. The shown examples with outwardly protruding hooks on the sleeve and cooperating openings in the lid are elected because of advantages in relation to injec-

tion mould design. Apart from that, the esthetic possibilities are very good.

#### WHAT WE CLAIM IS:—

- 5      1. A child-proof closure for a container comprising a first part formed as a sleeve intended to be fixed in position on the container and a second part formed as a lid adapted to close an upper open end of the sleeve, at least one of the parts of the closure being made of elastically deformable material, the sleeve and lid having interlocking parts which, when the lid is in its closed position interlock with one another so that the sleeve cannot be opened by a simple upward movement of the lid, disengagement of the interlocking parts to permit opening of the lid being effected by squeezing.
- 10     2. A child-proof closure according to claim 1 wherein the sleeve and the lid have interlocking parts which, in the closed position, engage at the end of one of the diameters of the parts i.e. an interlocking diameter, in such a way, that they disengage when one of the parts is squeezed either along the interlocking diameter or along a force diameter displaced therefrom.
- 15     3. A child-proof closure according to claim 2 including a pair of interlocking parts situated at both ends of the interlocking diameter.
- 20     4. A child-proof closure according to claim 2 characterised by a pair of interlocking parts positioned at one end of the interlocking diameter and a hinge between the sleeve and the lid positioned at the other end of the interlocking diameter.
- 25     5. A child-proof closure according to claim 2 or 3 wherein the interlocking parts are released by squeezing along a force diameter which forms an angle of substantially  $90^\circ$  with the interlocking diameter.
- 30     6. A child-proof closure according to claim 2 or 3 characterised by an angle of substantially zero between interlocking diameter and force diameter.
- 35     7. A child-proof closure according to
- claim 3 wherein the interlocking parts comprise an outwardly protruding hook on the sleeve and a corresponding opening in the lid at each end of the interlocking diameter.
- 40     8. A child-proof closure according to claim 4 wherein the interlocking parts comprise an outwardly protruding hook on the sleeve and a corresponding opening in the lid at one end of the interlocking diameter.
- 45     9. A child-proof closure according to any one of the preceding claims 2 to 7 characterised by the fact that the part which is squeezed has finger grips at the ends of the force diameter of force radii.
- 50     10. A child-proof closure according to claims 8 and 9 having a hinge between the sleeve and the lid characterised by the fact that disengagement of the sleeve and the lid is effected by squeezing along force radii which form an angle of between  $100^\circ$  and  $120^\circ$  with a radius passing through the opening, the location of the finger grips indicating the position of the force radii.
- 55     11. A child-proof closure according to any one of the preceding claims 2 to 10 wherein the lid has a skirt which is strengthened at the ends of the force diameter or the force radii in relation to the ends of the interlocking diameter in order to facilitate an oval deformation.
- 60     12. A child-proof closure according to claim 11 characterised by the fact that the skirt of the lid has a greater wall thickness at the ends of the force diameter or the force radii than at the ends of the interlocking diameter.
- 65     13. A child-proof closure according to any of claims 4 and 7 to 12 characterised by the fact that the hinge is a snap hinge.
- 70     14. A child-proof closure substantially as hereinbefore described with reference to the accompanying drawings.

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(1)

FIG. 1.

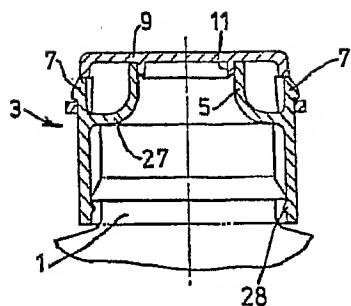


FIG. 3.

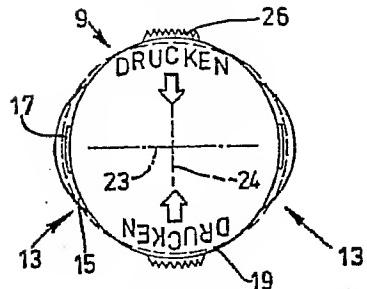


FIG. 2.

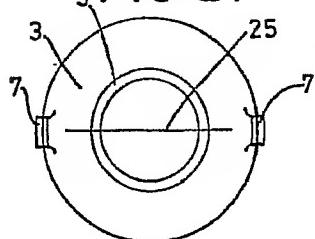


FIG. 4.

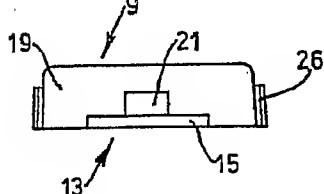


FIG. 5.

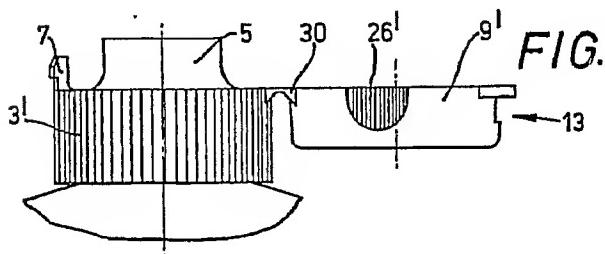


FIG. 6.

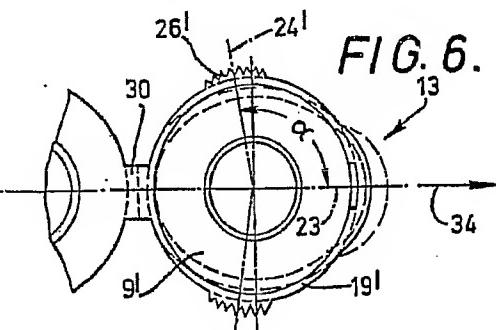
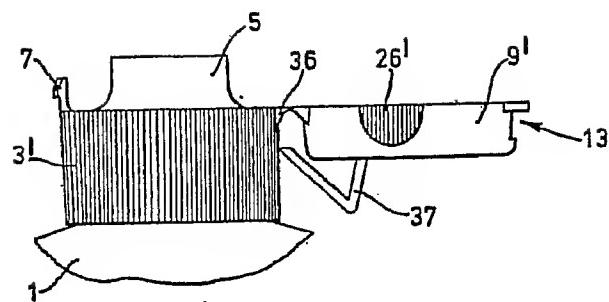


FIG. 7.



# CAP OF CONTAINER FOR BEVERAGE

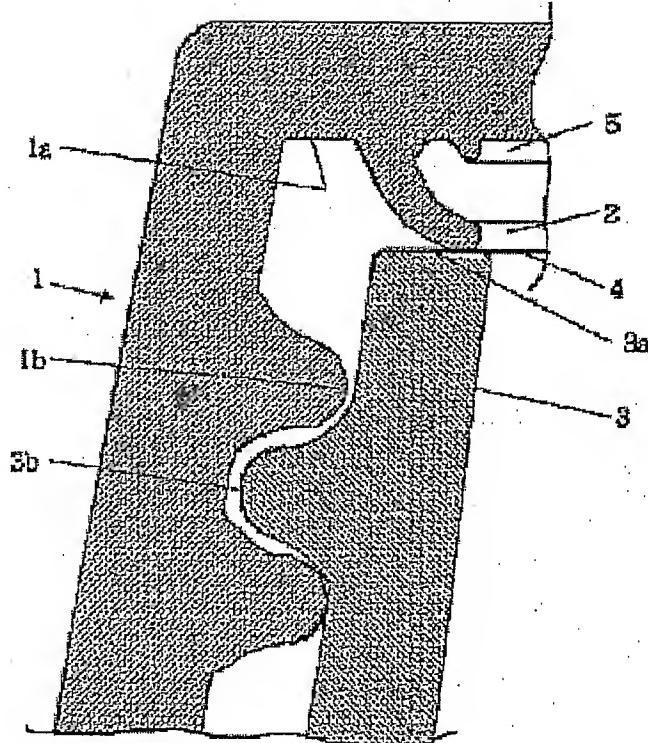
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 Applicant: RUNA KASEI KK  
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 - European:  
 Application number: JP19990033608 19990212  
 Priority number(s): JP19990033608 19990212

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## Abstract of JP2000229651

**PROBLEM TO BE SOLVED:** To double prevent the liquid leakage by covering a thin sealant on a bottle mouth, pressing it against an upper end face of the bottle mouth of a container to which the sealant is attached, circumferentially providing a flexible claw ring to prevent the liquid leakage around a top inner surface of a cap, bending the claw ring when the cap is screwed to the bottle mouth, and pressing it against the thin sealant.

**SOLUTION:** A claw ring 2 bent to a center side of a cap is circumferentially provided opposite to an upper end face of a bottle mouth 3 close to an outer edge of a top inner surface 1a of the cap 1. The upper end face 3a of the bottle mouth 3 is pressed against an aluminum foil 4, and the liquid leakage of a beverage is prevented by screwing a thread 1b provided on an inner circumferential wall of the cap 1 with a thread 3b provided on an inner circumferential wall of the bottle mouth 3 to press the claw ring 2 against the aluminum foil 4. A projecting ring 5 is circumferentially provided on the top inner surface 1a on the center side of the cap 1 close to a base part of the claw ring 2, and when the claw ring 2 is bent, the tip part is pressed against the projecting ring 5 to double prevent the liquid leakage. The leakage of the beverage is completely prevented thereby.



PN - JP2000229651 A 20000822  
 PD - 2000-08-22  
 PR - JP19990033608 19990212  
 OPD - 1999-02-12  
 TI - CAP OF CONTAINER FOR BEVERAGE  
 AB - PROBLEM TO BE SOLVED: To double prevent the liquid leakage by covering a thin sealant on a bottle mouth, pressing it against an upper end face of the bottle mouth of a container to which the sealant is attached, circumferentially providing a flexible claw ring to prevent the liquid leakage around a top inner surface of a cap, bending the claw ring when the cap is screwed to the bottle mouth, and pressing it against the thin sealant. SOLUTION: A claw ring 2 bent to a center side of a cap is circumferentially provided opposite to an upper end face of a bottle mouth 3 close to an outer edge of a top inner surface 1a of the cap 1. The upper end face 3a of the bottle mouth 3 is pressed against an aluminum foil 4, and the liquid leakage of a beverage is prevented by screwing a thread 1b provided on an inner circumferential wall of the cap 1 with a thread 3b provided on an inner circumferential wall of the bottle mouth 3 to press the claw ring 2 against the aluminum foil 4. A projecting ring 5 is circumferentially provided on the top inner surface 1a on the center side of the cap 1 close to a base part of the claw ring 2, and when the claw ring 2 is bent, the tip part is pressed against the projecting ring 5 to double prevent the liquid leakage. The leakage of the beverage is completely prevented thereby.

IN - MATSUOKA HIROSHI  
 PA - RUNA KASEI KK  
 IC - B65D41/04

TI - Cap structure for beverage container such as milk bottles, consists of pawl ring which contacts upper surface of aluminum seal sealed to bottle mouth  
 PR - JP19990033608 19990212  
 PN - JP2000229651 A 20000822 DW200054 B65D41/04 003pp  
 PA - (LUNA-N) LUNA KASEI KK  
 IC - B65D41/04  
 AB - JP2000229651 NOVELTY - A cap structure consists of a pawl ring (2) which contacts the upper surface of the bottle mouth. The mouth is sealed with an aluminum sealant (4). The pawl ring is attached to the inner upper surface of the cap structure by pressure welding.  
 - USE - For beverage container such as milk bottles.  
 - ADVANTAGE - Provision of aluminum seal with pawl ring prevents leaking.  
 - DESCRIPTION OF DRAWING(S) - The figure shows the partial enlarged sectional view of the cap and container structure.  
 - Pawl ring 2  
 - Aluminum sealant 4  
 - (Dwg.2/3)  
 OPD - 1999-02-12  
 AN - 2000-576162 [54]

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 PA - RUNA KASEI KK  
 TI - CAP OF CONTAINER FOR BEVERAGE

- AB - PROBLEM TO BE SOLVED: To double prevent the liquid leakage by covering a thin sealant on a bottle mouth, pressing it against an upper end face of the bottle mouth of a container to which the sealant is attached, circumferentially providing a flexible claw ring to prevent the liquid leakage around a top inner surface of a cap, bending the claw ring when the cap is screwed to the bottle mouth, and pressing it against the thin sealant.
- SOLUTION: A claw ring 2 bent to a center side of a cap is circumferentially provided opposite to an upper end face of a bottle mouth 3 close to an outer edge of a top inner surface 1a of the cap 1. The upper end face 3a of the bottle mouth 3 is pressed against an aluminum foil 4, and the liquid leakage of a beverage is prevented by screwing a thread 1b provided on an inner circumferential wall of the cap 1 with a thread 3b provided on an inner circumferential wall of the bottle mouth 3 to press the claw ring 2 against the aluminum foil 4. A projecting ring 5 is circumferentially provided on the top inner surface 1a on the center side of the cap 1 close to a base part of the claw ring 2, and when the claw ring 2 is bent, the tip part is pressed against the projecting ring 5 to double prevent the liquid leakage. The leakage of the beverage is completely prevented thereby.
- B65D41/04

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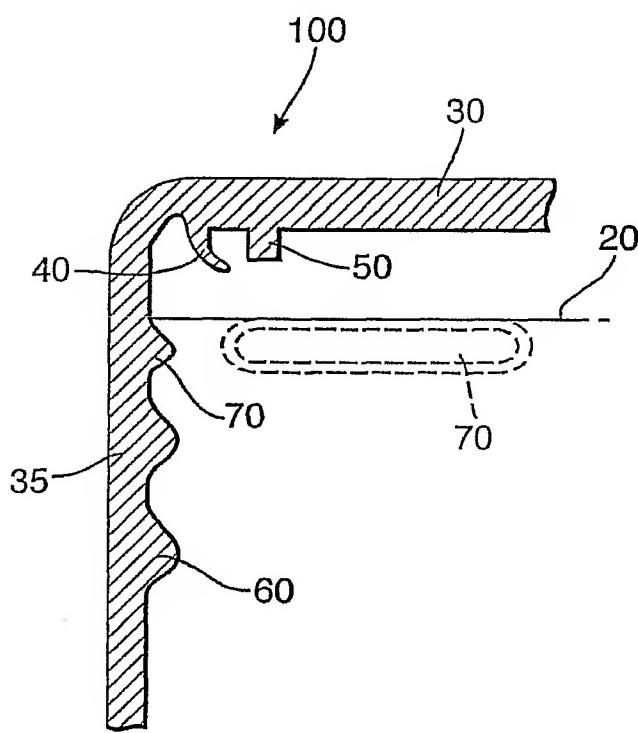
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[Continued on next page]

(54) Title: WADLESS CLOSURE



(57) Abstract: A closure (100,200) for a container (210), the closure (100,200) comprising a wadless membrane (20,220) and a shell (30), wherein the membrane (20,220) is adapted to be heat sealed to a rim (217) of a container to provide a gas-tight barrier, wherein the shell (30) has a downwardly extending resilient sealing element (40,240) for providing an even sealing pressure to the membrane (20,220) during heat sealing and for providing a gas-tight re-seal once the membrane (20,220) has been broken or removed.

WO 2006/000532 A1



SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN,  
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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

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## Description

### WADLESS CLOSURE

- [001] The present invention relates to a closure, comprising a shell and a membrane, for a container and a method of sealing a container with such a closure.
- [002] Closures are known which comprise a membrane to be sealed to the rim of a container, overlain by a shell which protects the membrane's relatively delicate nature. Correspondingly, containers are known in association with these closures wherein a membrane has been sealed to the rim and is protected by a shell. Once the membrane is removed, the shell is then used to re-seal the container, since the shell is manufactured from a relatively good gas-tight material. This type of closure is often used for products such as coffee granules where it is necessary to have a gas-tight barrier well sealed over the container's opening to maintain shelf-life of the product. This barrier is provided by a membrane such as an aluminium foil. Once purchased, the shell is firstly removed. The foil is then also removed to allow access to the product. Since products are often not consumed all at once it is preferable that the container be closed by as good a gas-tight barrier and with as good a seal between barrier and container as possible. This is typically achieved by re-fitting the shell to the container. The shell alone is accepted as being a poorer gas-tight barrier than a well sealed membrane.
- [003] One well known closure comprises a membrane and a wad which together rest inside a shell prior to fitting to the container. The membrane and wad have an adhesive, positioned between them to retain the two together. A further layer of adhesive is positioned on the side of the membrane closest to the container, when fitted. When the shell is positioned on the container it provides a closing force which applies pressure to the further layer of adhesive and to the membrane. The layer of adhesive then adheres the membrane to the rim of the container. This may be achieved by heat activation of the adhesive layer by means of induction heating. Alternatively the adhesive may be of the so-called "hot melt glue" variety which does not require further heat for activation but rather, simply adheres the membrane to the rim of the container by means of the pressure applied by the shell.
- [004] If induction heating is employed the heating may also be employed to weaken the layer of adhesive lying between the membrane and wad. This has the effect that when the shell is removed the wad remains within the shell and the membrane remains sealed and affixed to the rim of the container.
- [005] The purpose of the wad is two-fold. Firstly, it provides a cushion-effect so that an even pressure is applied from the shell to the membrane. This has the advantage that if containers are used which have inherently uneven rim surfaces, the membrane is still efficiently adhered to the rim to ensure effective sealing. Secondly, once the membrane

has been removed by the user, the wad provides re-sealing qualities against the rim of the container. This is achieved by the resilient nature of the wad. The above described closure is taught in

US 6277478 --.

[006] A problem inherent with this type of closure is that it is relatively expensive in that a wad and a membrane are provided.

[007]

EP 1211180 A --.

discloses a closure which has only a membrane and no wad. To provide a sufficient force onto the membrane to seal it to the container's rim, by means of heat induction for instance, a rib is provided on the underside of the shell. This rib is present along and above the rim of the container so that the membrane is squeezed between the two during the sealing of the membrane to the rim. However, the rib is not resilient and does not provide an even force to cater for uneven rims as maybe typically found with glass containers. Accordingly, the membrane is not always perfectly sealed to the rim of the container.

[008] Further, in some instances there is a need for the closure to be oriented on the container in a particular manner. For example, if the closure and associated container are not circular in plan. In such a situation if the closure and container are held together by screw threads then there is a possibility, due to manufacturing tolerances in the physical size and relationship of the container and closure, that the rib will not be able to provide sufficient pressure, if any, to press the membrane onto the rim of the container during induction heating. Such a situation does not typically arise where there is no orientational requirement between the closure and container since the problem may be overcome by further twisting of the closure onto the container (so-called "torquing up").

[009] Another problem with the known rib-type closures is that since this rib is not resilient it does not provide a re-seal quality sufficient to provide a gas-tight seal to keep the product within the container fresh for a relatively long time, such as weeks or even months.

[010] Accordingly, it would be desirable to have a closure which has only a removable membrane for providing a gas-tight barrier on manufacture, but which also has a shell with good re-sealing qualities so that after the membrane has been removed by the user, the re-seal quality is sufficient to maintain the product within the container fresh for a relatively long time. Further, it would be desirable to have a closure which provides an even pressure to a membrane so that it may be sealed effectively to the rim of an associated container.

[011] In one aspect the present invention provides a closure for a container, the closure

comprising a wadless membrane and a shell, wherein the membrane is adapted to be heat sealed to a rim of a container to provide a gas-tight barrier, wherein the shell has a downwardly extending resilient sealing element for providing an even sealing pressure to the membrane during heat sealing and for providing a gas-tight re-seal once the membrane has been broken or removed.

- [012] In another aspect the present invention provides a method of sealing a container with a closure comprising the steps of moulding a shell, fixing the shell to the container wherein a wadless barrier membrane is located between the shell and the container, and adhering the membrane to a rim of the container by heat sealing, wherein the shell comprises a resilient sealing element for providing an even sealing pressure to the membrane during heat sealing and for providing a gas-tight re-seal once the membrane has been broken or removed.
- [013] Further embodiments and features of the invention are disclosed in the dependent claims attached hereto.
- [014] The present invention and its advantages will be better understood by referring, by way of example, to the following detailed description and the attached Figures, in which:
- [015] Figure 1 shows a cross-section of a closure according to one embodiment of the invention,
- [016] Figure 2 shows a cross-section of a membrane according to one embodiment of the invention,
- [017] Figure 3 shows an enlarged view of a section of a closure showing one embodiment of a sealing element,
- [018] Figure 4 shows an enlarged view of a section of a closure showing another embodiment of a sealing element, and
- [019] Figure 5 shows a cross-sectional side view of yet another embodiment of a closure according to the present invention.
- [020] In Figure 1, a closure 100 comprises a shell 30 which has a top plate and a downwardly extending skirt 35. In this specification, orientational words such as "downwardly" are used with regard to the drawings and are not meant to be limiting.
- [021] This skirt 35 has screw threads 60 positioned on the inside and projecting radially inward. These screw threads 60 interact with screw threads (not shown) positioned on the outside of a container's neck area so as to enable the closure 100 to be screwed onto the container.
- [022] A membrane 20 is also shown. Before being sealed to the container the membrane 20 is placed inside the closure 100 so that it initially rests on projections 70. These projections 70 exist in an annulus around the inside of the skirt 35. They may be either in the form of a continuous annulus or a discontinuous annulus. Alternatively, no

projections 70 may be provided and the membrane 20 may just rest on the threads 60.

[023] Membrane 20 lies on top of the container and provides a gas-tight barrier when adhered to the rim of the container. This is not only due to the seal between the rim and the membrane (20) but also due to the oxygen barrier qualities of the membrane (20).

[024] From the underside of the shell 30 a downwardly extending claw-type sealing element 40 is present in a annulus around the inside of the perimeter of the shell 30. Such a claw-type sealing element is known from GB-A-2,222,821.

[025] A stop 50 downwardly extending from the underside of the shell may also be present. This stop 50 is also annular and lies around the perimeter of the shell but radially inward from the claw-type sealing element 40.

[026] The claw-type sealing element 40 is a rib which, in cross-section, tapers towards the end distal from the shell. It has a curved nature so that it gently curves radially inward. However, the sealing element 40 may also curve radially outward.

[027] During manufacture, the membrane 20 is fitted inside the shell 30 and held either by projections 70 or threads 60. The shell 30 is then fitted to the container so that the threads 60 interact to hold the two together. The shell 30 may be fitted by either being pushed over the container's mouth or by rotation. If fitted by being pushed over the container's mouth, the shell will flex slightly to allow the threads 60 on the inside of the skirt to jump or pass over the threads 70 on the outside wall of the container before resuming its initial shape to ensure that the two sets of threads engage properly.

[028] Once in place, the resilient sealing element 40 provides a force to push the membrane onto the rim of the container. The force is evenly distributed by the resilient nature of the sealing element 40 which ensures that even when containers with uneven rims are used the membrane may be efficiently sealed to the container. Typical materials used to fabricate containers which may have uneven rim surfaces are glass and metal. In the latter case, metal containers which have welded seams often have a so-called "weld-step" on the rim which can exacerbate the unevenness.

[029] A cross-section of one type of membrane 20 is shown in Figure 2. The membrane 20 has a layer of sealing adhesive 24 shown on its lower surface. However, this layer of adhesive 24 may be provided directly on to the rim of the container, rather than as a layer with the pre-formed membrane 20. If non-heat-activated adhesive 24 is employed the pressure provided by the sealing element 40 will seal the membrane 20 to the rim of the container. However, if heat-activated adhesive 24 is employed the combined container and closure 100 are passed through apparatus which provides heat to the adhesive layer 24. One typical method is by induction-heating of the membrane 20, which then passes heat to the adhesive layer 24 by means of conduction. In this case the membrane 20 has to have at least a partial metallic composition. However, other forms of heating the adhesive 24 are known such as direct conduction heating. In

addition to heat being provided, pressure is provided by the resilient sealing element so that the combination of the heat and pressure seals the membrane 20 to the rim of the container.

- [030] The heating of the heat-activated adhesive layer 24 activates its adhesive qualities so that the membrane 20 is adhered to the rim of the container, thus providing an air-tight, integral and hermetic barrier. However, the adhesive may be chosen so that the membrane may be easily peeled off from the rim of the container.
- [031] To aid the peeling off of the membrane a tab (not shown) may be positioned at its edge. In this case the tab may either be downwardly depending from the edge of the membrane so that it is sandwiched between the two sets of threads 60, or may be bent back on itself so that it lies on the top of the membrane. Alternatively, the tab may be positioned on top and away from the edge of the membrane 20. Another possibility is that no tab exists but rather the membrane is sized so that it is slightly larger than the outer rim of the container to provide an edge which can be gripped by the user to aid peeling off of the membrane.
- [032] The membrane 20 may also have a layer 26 on its upper surface. This layer may comprise any combination of print or lacquer and may also consist of a protective layer formed from a polymer. This layer may also be embossed.
- [033] It has been found that, contrary to expectation, the sealing element 40 is not damaged by the heating effect by, for instance, permanent deformation and therefore does not lose its resilience.
- [034] Once the user removes the shell 30 and the membrane 20, in order to access the product within the container, the shell 30 is ideally re-fitted to reduce degradation of the product by contact with the atmosphere. This is achieved since the shell 30 may be manufactured from a gas-tight barrier material and it is re-sealed to the rim of the container by screwing it onto the container. The re-seal effect is provided by the sealing element 40 interacting with the top of the rim of the container. Since the sealing element 40 is resilient it applies even pressure even onto an uneven surface such as may occur with glass or metal containers.
- [035] Further, it should be understood that the well-sealed initial membrane provides a degree of gas-tightness which is required to keep a product, on the shelf of a shop or in a warehouse, fresh for many months. Conversely, the degree of gas-tightness required after the product has been bought and opened is less since typically the product is consumed within a few weeks.
- [036] Accordingly, it is accepted that the gas-tight barrier properties of a re-fitted shell are poorer than the initial well-sealed membrane. However, it has been shown that a shell with the above described resilient element substantially improves the gas-tightness compared to the prior art.

- [037] To prevent over-tightening of the shell 30 with the container, a stop 50 may be provided as described above with reference to Figure 1. The rim of the container will meet the underside of the stop 50 and prevent the shell 30 from moving closer to the rim of the container.
- [038] It may be arranged that the resilient sealing element 40 is pinched between the stop and the rim of the container to provide a seal.
- [039] In Figures 3 and 4 two further embodiments of resilient sealing elements are shown. The element 42 Figure 3 takes the form of a "finger" shape. Although shown as approximately having the same cross-section along its length it could be frusto-conical in shape.
- [040] Figure 4 shows an embodiment whereby a block of resilient material 44 different from the material of the rest of the closure, is formed with the material of the rest of the closure using such known methods as bi-injection moulding to produce a one-piece closure. An example of such resilient material is TPE (thermo-plastic elastomer).
- [041] Another embodiment of the present invention is shown in Figure 5 and relates to closures which have to be oriented onto an associated container neck in a particular way so that the closure and container lie in a specific orientation relative to one another. Such closures and containers are known in which the cross-sectional shape is oval. However, other non-circular shapes are also contemplated. For example, shampoo or shower-gel like containers are often produced wherein the closure fits onto the shoulder of the container such that there is an unbroken surface between the two: Of course, there could be reasons why container/closure combinations which are circularly shaped in plan may be required to have orientational relationships. Further, such container/closure combinations can of course also be used for other products such as food products.
- [042] A container 210 is shown with a closure 200 fitted. The container has a neck portion 215 which includes threads 216 on its outer radial surface. These threads 216 are for interaction with the threads 260 on the closure 200 so as to hold the two parts 200,210 together. Although not shown, it is contemplated that the closure is not circular in plan but rather is oval. Accordingly, the closure 200 can only sit correctly on the container in two positions (each 180 degrees away from the other, about an axis running through the container 210 and closure 200 through the centre of the discharge orifice 290) to produce the overall desired shape.
- [043] To ensure that the container 210 and closure 200 will fit together correctly and to seal the container with the closure the threads 216, 260 are carefully designed. However, due to the nature of the material used in the manufacture of the container and closure and the tolerances which are inherent in such manufacturing processes it is not possible to guarantee a gas-tight seal between the container 210 and closure 200.

- [044] By use of the above described invention this problem is overcome and it is possible to provide this gas-tight seal after filling.
- [045] This is achieved by having a downwardly depending resilient sealing element 240 which provides an even sealing pressure to a membrane 220 which is positioned across the top and over the orifice 290 of the container neck 215. This is achieved because the resilient sealing element 240 will compensate for the tolerances of the closure/container combination. In other words, the resilient sealing element 240 will compensate for any possible gap between the underside of the closure 200 and the rim 217 of the container.
- [046] The membrane 220 is positioned and then sealed across the top of the container mouth by such methods as described above, for example by heat sealing.
- [047] Once the membrane 220 is removed by the consumer, prior to the first discharge of product from the container, the resilient sealing element 240 will also provide a gas-tight re-seal, as described above, by pressing against the rim 217 of the container's mouth. Since the sealing element 240 is resilient it will compensate for the removal of the membrane 220 even though this will slightly increase the gap between the underside of the closure 200 and the top of the rim 217 of the container.
- [048] To be able to discharge product from the container the closure may simply be removed by unscrewing from the container. Alternatively the closure could have an orifice 290 in its upper surface. This orifice 290 would then need to be sealed in a gas-tight manner to maintain the life of the product within the container 210. This may be achieved in a number of different ways not all of which are shown in Figure 5.
- [049] For instance, another secondary closure device 300 could be associated with the primary closure 200. This secondary closure could be in the form of a cover 310. This cover 310 could be hinged to the primary closure 200, at, for example, the point marked 280 in Figure 5. Alternatively, the secondary closure 300 could have a sliding relationship with the closure 200, or simply be completely detachable.
- [050] On the underside of the secondary closure 300 a simple plug could be formed which would have an interference fit with the orifice 290 to seal it thereby. Alternatively, an annulus 330 could be formed on the underside of the closure 300 which would have an interference fit with the outside of the orifice 290. Of course both alternatives could be also be employed at the same time.
- [051] In one embodiment the orifice 290 may have a self-closing valve 250, such valves being well known in the art, provided. These valves typically do not provide a gas-tight re-seal without some form of mechanical interaction from a lid. Accordingly, in the embodiment with such a valve 250, as shown in Figure 5, a projection 320 is formed on the underside of the cover 310. Further an annulus 330, as described above, is also formed on the underside of the cover 310. The projection 320 presses against, or at

least is very close to, the valve 250 when the secondary closure 300 is in the closed position in relation to closure 200. This prevents the valve 250 from opening. Further, and again when the secondary closure 300 is in the closed position in relation to the closure 200, the annulus 330 has an interference fit around the outside of the orifice 290. These two mechanical means provide a gas-tight seal. Accordingly, even when the membrane 220 has been removed from the container 210 the contents of the container 210 are maintained in a gas-tight manner. This is because of the resilient sealing element 240 together with the means described above provided on the secondary closure 300.

- [052] Although the embodiment described above in relation to Figure 5 is shown with the closure at the top of the container it should be understood that in fact the closure could be situated at the bottom of the container.
- [053] With regard to the membrane 20, 220 in any of the above described embodiments, it is possible to use aluminium foil. Such foil typically has a thickness of between 9 and 200 µm. Other metals and materials are also possible.
- [054] Although it has been described how the membrane 20, 220 is fitted inside the shell 30 prior to fitting the shell 30 to the container, it is also possible that instead the membrane is positioned over the rim of the container prior to the shell being fitted. In this case the membrane 20, 220 may be sealed to the rim of the container by external pressure and/or heat supplied by the manufacturing apparatus.
- [055] Also, the closure 100, 200 has been described as having screw threads 60, 260 which interact with corresponding screw threads on the container's neck. However, screw threads are not essential since the closure 100, 200 could be snap fitted to the container by means of beads well known in the art.
- [056] Further, the membrane 20, 220 may be designed so that rather than being removable by peeling it is merely broken through so that the membrane may still be in position in the vicinity of, and on top of, the rim of the container.
- [057] Further still, the type of container with which such a closure 100, 200 may be used is not limited to glass, but may be of other typically used materials such as PET, polypropylene or metal such as aluminium or tin-plated steel.
- [058] Finally, the closure could be of the flip-top type.

## Claims

- [001] A closure (100,200) for a container (210), the closure (100,200) comprising a wadless membrane (20,220) and a shell (30), wherein the membrane (20,220) is adapted to be heat sealed to a rim (217) of a container (210) to provide a gas-tight barrier,  
characterised in that,  
the shell (30) has a downwardly extending resilient sealing element (40,240) for providing an even sealing pressure to the membrane (20,220) during heat sealing and for providing a gas-tight re-seal once the membrane (20,220) has been broken or removed.
- [002] A closure (100,200) according to claim 1, wherein the closure is designed such that it has to be rotationally oriented to an associated container (210) in a particular manner.
- [003] A closure (100,200) according to either of claims 1 or 2, wherein the membrane (20,220) includes a metal foil.
- [004] A closure (100,200) according to any preceding claim, wherein the membrane is between 9 and 200 µm in thickness.
- [005] A closure (100,200) according to any preceding claim, wherein the membrane (20,220) is peelably removable.
- [006] A closure (100,200) according to any preceding claim in combination with a container wherein said membrane (20,220) is heat sealed to the rim (217) of the container.
- [007] A method of sealing a container with a closure (100,200) comprising the steps of:  
(a) moulding a shell (30),  
(b) fixing the shell (30) to the container wherein  
a wadless barrier membrane (20,220) is located between the shell (30) and the container, and  
(c) adhering the membrane (20,220) to a rim (217) of the container by heat sealing;  
characterised in that  
the shell (30) comprises a resilient sealing element (40,240) for providing an even sealing pressure to the membrane (20,220) during heat sealing and for providing a gas-tight re-seal once the membrane (20,220) has been broken or removed.
- [008] A method of sealing a container according to claim 6, wherein the closure (100,200) is designated such that it has to be rotationally oriented to an

- associated container (210) in a particular manner.
- [009] A method of sealing a container according to either of claims 6 or 7, wherein the membrane (20,220) is retained in the shell (30) prior to being sealed to the rim (217) of the container.
- [010] A method of sealing a container according to any of claims 6 to 8, wherein the membrane (20,220) includes a metal foil.
- [011] A method of sealing a container according to any of claims 6 to 9, wherein the membrane (20,220) is between 9 and 200 µm in thickness.
- [012] A method of sealing a container according to any of claims 6 to 10, wherein the membrane (20,220) is peelably removable.
- [013] A method of sealing a container according to any of claims 6 to 11, wherein the membrane (20,220) is heat sealed to the rim (217) of the container.

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Fig.1.

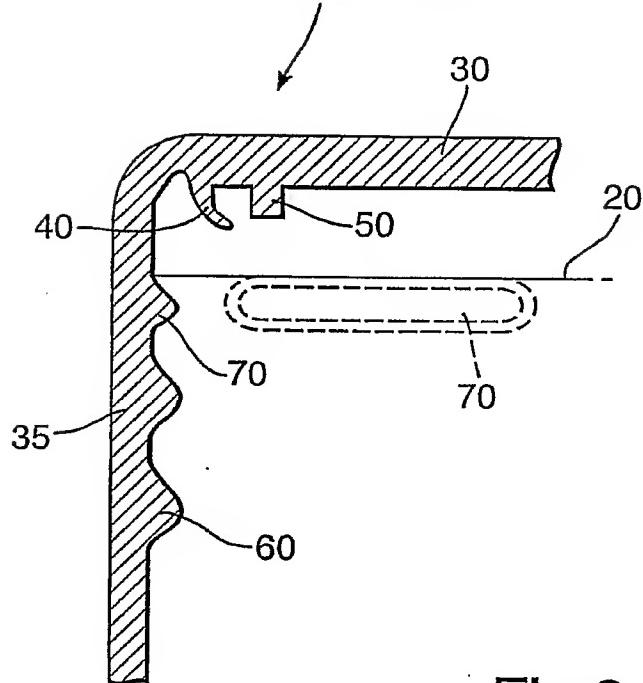


Fig.2.

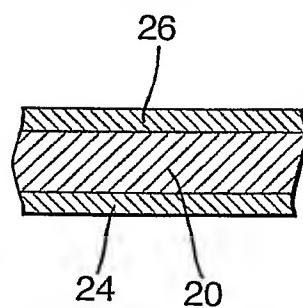


Fig.3.

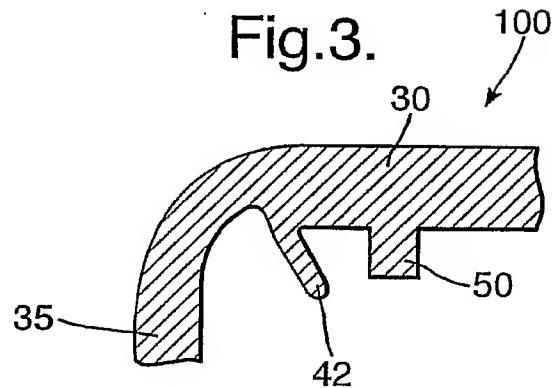
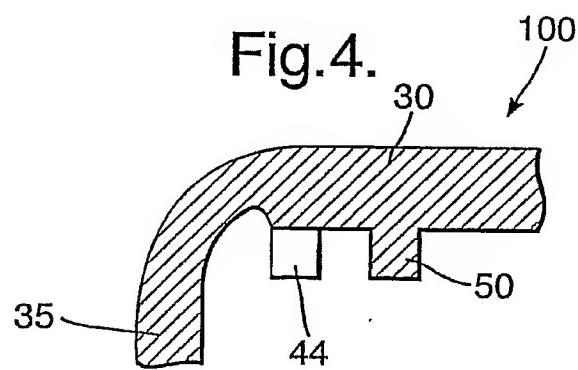
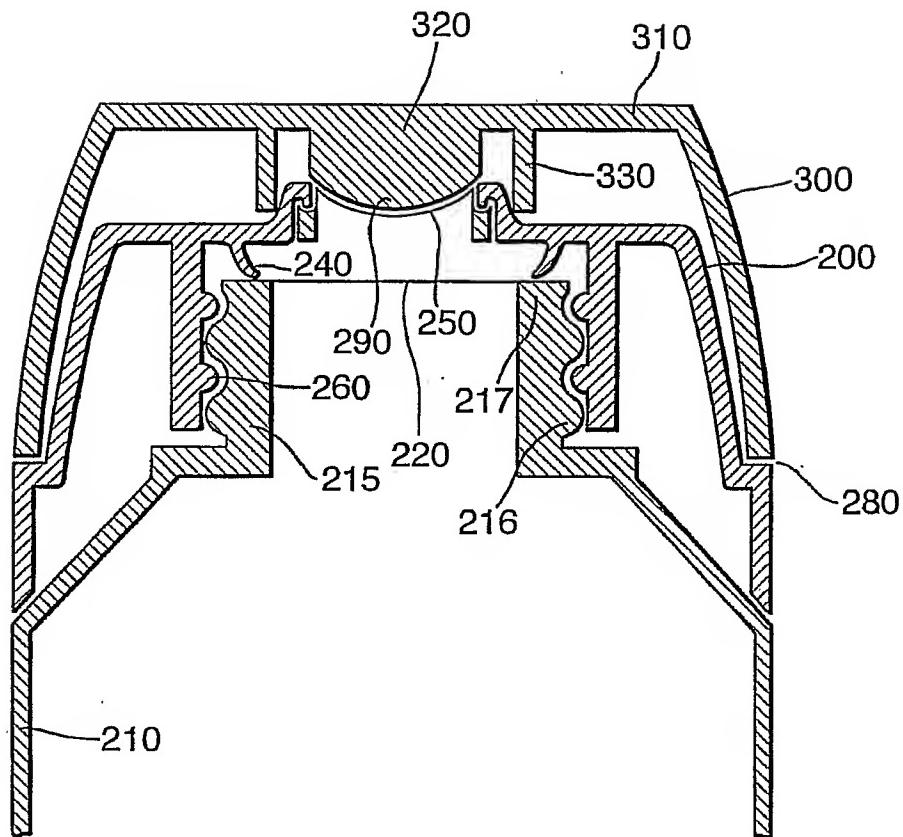


Fig.4.



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Fig.5.



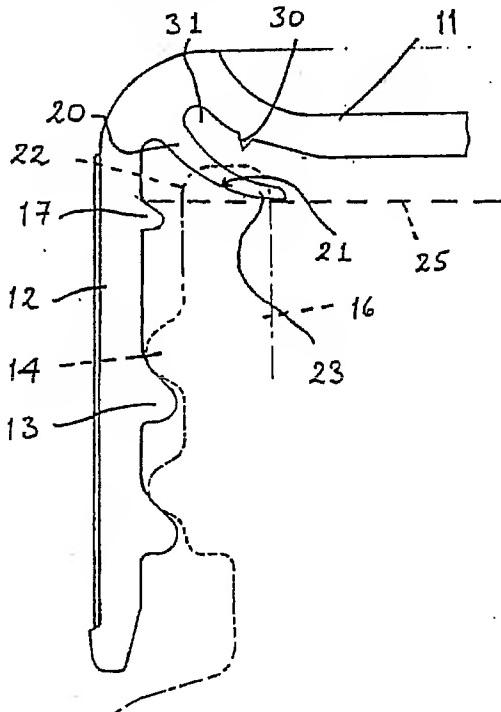
# UK Patent Application GB 2 311 283 A

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(22) Date of Filing 19.03.1996	(52) UK CL (Edition O ) B8T THCS
(71) Applicant(s) Lawson Mardon (Sutton) Limited  (Incorporated in the United Kingdom)  Forest Works, Coxmoor Road, SUTTON-IN-ASHFIELD, Nottinghamshire, NG17 5LH, United Kingdom	(56) Documents Cited GB 2222821 A      GB 2148861 A      GB 2123392 A GB 2120219 A      EP 0568288 A1      EP 0109631 A2 US 4398645 A      US 3814274 A
(72) Inventor(s) Karl Mondszein	(58) Field of Search UK CL (Edition O ) B8T TAX TCA TCC TCM TCP THB THCS THMS THRS INT CL <sup>6</sup> B65D 41/00 41/02 41/04 41/06 41/10 41/16 41/20 41/32 41/34 41/40 41/46 41/50
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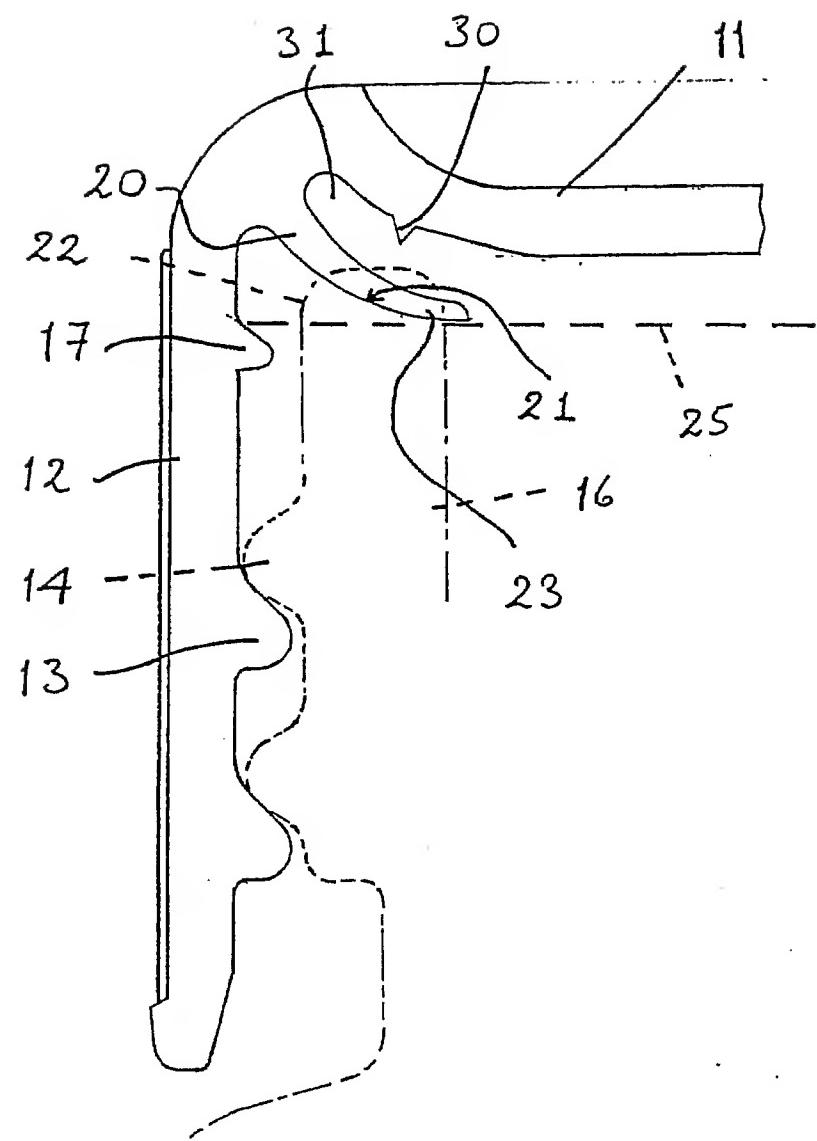
(54) Cap for a container

(57) The cap comprises a one-piece plastics moulding including a skirt (12), with a screw thread (13), a top (11) and sealing means (20,30) depending from the top. The sealing means comprises an annular projection (30) and an annular sealing member (20) whose root is radially spaced from the projection. The sealing member (20) curves towards the projection (30) and, in use, is clamped between the projection and the rim (22) of a container. The cap may include support means (17) for a sealing membrane (25), which adheres to the container rim (22) with the cap engaged on the container.



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## CAP FOR A CONTAINER

The present invention relates to a cap for a container and is concerned with providing an improved seal between the cap and a  
5 container.

The invention is applicable to the type of cap in which there is means for effecting rotary disengagement with the container, usually by means of screw threads, but also, for example, by a bayonet fitting.

10

Caps of this type are known having an annular projection for sealingly engaging the rim of a container.

The cap of the present invention provides an improved seal and is  
15 especially useful for containing hygroscopic materials. One particular use is for a container of tea, or coffee to permit resealing of the container, with exclusion of water vapour.

One example of a prior art cap is disclosed in GB-2123392. This  
20 cap has an annular projection of triangular cross-section and, initially a frangible sealing membrane is weakly adhered in the top of the cap across the projection. The opposite side of the membrane carries an adhesive which strongly adheres to the rim of a glass jar when the cap is secured on the jar. The cap can then be removed, the membrane broken and the  
25 jar resealed by engagement of the annular projection with the container rim.

One disadvantage with this arrangement is that, once the membrane seal is broken, the resealing of the jar is insufficiently effective. Due to  
30 variations in manufacture, especially of glass jars, resealing may be poor

with resultant deterioration of the contents, such as coffee.

It is, therefore, usual for a cap for a coffee jar, for example, to have a separate, resilient wad adhered in the cap. The frangible 5 membrane is initially carried by the wad and adheres to the jar, so that, on opening of the jar, the wad separates from the membrane.

This arrangement still does not, however, provide a good seal, once the membrane has been broken, due to undulations in the rim of the jar.  
10 Furthermore, this is an expensive addition to a coffee cap.

GB-2117360 discloses a cap which has an improved sealing arrangement for taking account of thickness tolerances in a glass jar. This document provides two radially spaced annular seals, dependent from the 15 top of the cap. One of these seals is resiliently flexible and is curved, so that a convex face of the seal engages with the jar rim. The provision of two seals improves the probability of good overall sealing. The design, however is not suitable for supporting a frangible membrane and sealing is still unreliable, especially with glass containers.

20

The present invention provides a cap which provides an improved seal with a container, despite frequent removal of the cap, and is easy to manufacture at low cost.

25

The present invention provides a cap for a container having a skirt provided with means for effecting rotary disengagement of the cap from a container and rotary re-engagement with the container so as axially to urge an annular seal of the cap against a rim of the container, the annular seal comprising an annular projection extending inwardly from the top of 30 the cap, and an annular, resiliently flexible, curved sealing member

projecting inwardly from the cap, the sealing member curving towards the projection so as to be deflectable by engagement with the rim of a container into contact with the projection, whereby the sealing member is sealingly clamped between the rim and the annular projection.

5

Reference is now made to the accompanying drawings, wherein the sole figure is a cross-sectional view of a part of a cap according to the invention.

10

The cap shown is a one-piece injection moulding of plastics material and has a top 11 and a skirt 12. The skirt has an internal threads, or part threads, 13 for screw-engagement with threads 14 on a container, such as a glass jar 16.

15

The skirt also has an annular, radial inward support flange 17 between the top 11 and the threads 13.

20

A sealing member 20, which is an integral part of the cap moulding, projects from the top 11 of the cap. In this embodiment, the sealing member projects from a location adjacent to the skirt 12 inwardly away from the skirt, but could be radially spaced from the skirt and project towards the skirt. The sealing member is an annular projection, which is elongate in cross-section and curves, so as to present a convex surface 21 to the top of the rim 22 of the jar 16, in use. The curved surface 21 flattens at the free end part of the sealing member and lies generally in a radial plane relative to the skirt 12.

25

The arrangement is such that a frangible membrane 25 can be supported between the support flange 17 and the free end part of the sealing member 20. The membrane 25 has an adhesive surface opposite

to the top 11 of the cap, so that, when the cap is screwed down onto a jar, the membrane adheres to the rim 22 of the jar and is resiliently urged against the rim by the sealing member 20. On removal of the cap, the support flange 17, is released from the membrane and the sealing member 5 20 will re-engage with the rim of the jar on re-closure.

Reliance on the sealing member alone, however, is insufficient to ensure a good seal, once the membrane 25 has been broken. There is provided an inwardly extending, annular projection 30 of triangular cross-section, integrally formed with the top 11 of the cap. The root of the projection 30 is radially spaced from the root of the sealing member 20, but the inner edge of the projection is located in axial alignment with a portion of the sealing member.

15 The arrangement is such that, when the cap is screwed down on the jar, the sealing member is clamped between the projection 30 and the rim of the jar. This provides a highly effective seal, which does not rely on maintenance of resilience in the sealing member.

20 A sealed chamber 31 is defined between the top 11 of the cap, the projection 30 and the sealing member 20, in the jar-closing position of the cap. This sealed chamber 31 provides resilience, urging the sealing member 20 into sealing engagement with the cap.

25 The cap provides reliable, resealability in a single plastics moulding avoiding the need for a sealing wad, while providing superior sealing to that provided by a wad.

## CLAIMS

1. A cap for a container having a skirt provided with means for effecting rotary disengagement of the cap from a container and rotary re-engagement with the container so as axially to urge an annular seal of the cap against a rim of the container, the annular seal comprising an annular projection extending inwardly from the top of the cap, and an annular, resiliently flexible, curved sealing member projecting inwardly from the cap, the sealing member curving towards the projection so as to be deflectable by engagement with the rim of a container into contact with the projection, whereby the sealing member is sealingly clamped between the rim and the annular projection.
2. A cap according to Claim 1, wherein the top, the skirt, the projection and the sealing member are integral parts of a one-piece plastics moulding.
3. A cap according to Claim 1 or 2, wherein a sealed annular chamber is defined between the top of the cap, the projection and the sealing member in the clamped position of the sealing member.
4. A cap according to Claim 1, 2 or 3, wherein the projection is generally of triangular cross-section.
5. A cap according to any preceding claim, wherein the skirt has circumferential, inwardly extending support means and a membrane is provided and is held by the support means, the membrane having an adhesive on its surface opposite to the top of the cap for adherence to the rim of a container, the membrane being releasable from the support means on disengagement of the cap from the container, leaving the membrane

adhered to the rim.

6. A cap according to Claim 5, wherein the sealing member bears on the membrane and urges the membrane against the support means.

5

7. A cap according to Claim 5 or 6, wherein the support means comprises a continuous, circumferential ring.

8. A cap according to Claim 5, 6 or 7, in combination with a  
10 container on which the cap is screw-engaged, the membrane being adhered to the container rim and the sealing means urging the membrane against the rim, with the sealing means being clamped between the rim and the projection.

15 9. A cap for a container substantially as herein described with reference to the accompanying drawings.



The  
Patent  
Office

1

Application No: GB 9605741.9  
Claims searched: 1-9

Examiner: John Wilson  
Date of search: 5 June 1996

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): B8T[THMS THRS THCS THB TCM TCP TCC TCA TAX]

Int Cl (Ed.6): B65D 41/00 41/02 41/04 41/06 41/10 41/16 41/20 41/32 41/34 41/40  
41/46 41/50

Other: -----

**Documents considered to be relevant:**

Category	Identity of document and relevant passage		Relevant to claims
X, Y	GB2222821A	Massmould - see the figs.	X:1-3 Y:5 at least
X, Y	GB2148861A	Metal Box plc - see the figs.	X:1-4 Y:5 at least
Y	GB2123392A	Mardon Illingworth - see the figs. [this doc. acknowledged in the specification]	Y: 5 at least
X, Y	GB2120219A	Metal Closures Gp. - see the figs.	X:1-4 Y:5 at least
X, Y	EP0568288A1	Owens-Illinois - see the figs.	X:1-3 Y:5 at least
X, Y	EP0109631A2	Wiedmer - see the figs.	X:1-4 Y:5 at least
X, Y	US4398645	Toeppen - see the figs.	X:1-4 Y:5 at least

X Document indicating lack of novelty or inventive step  
Y Document indicating lack of inventive step if combined with one or more other documents of same category.

& Member of the same patent family

A Document indicating technological background and/or state of the art.  
P Document published on or after the declared priority date but before the filing date of this invention.  
E Patent document published on or after, but with priority date earlier than, the filing date of this application.



The  
Patent  
Office

1

Application No: GB 9605741.9  
Claims searched: 1-9

Examiner: John Wilson  
Date of search: 5 June 1996

Category	Identity of document and relevant passage	Relevant to claims
X, Y	US3814274      McIntosh - see the figs.	X:1-3 Y:5 at least

- |   |   |   |  |
|---|---|---|--|
| X | Document indicating lack of novelty or inventive step   | A | Document indicating technological background and/or state of the art.  |
| Y | Document indicating lack of inventive step if combined with one or more other documents of same category. | P | Document published on or after the declared priority date but before the filing date of this invention.          |
| Z | Member of the same patent family  | E | Patent document published on or after, but with priority date earlier than, the filing date of this application. |

# PATENT COOPERATION TREATY

From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

RECEIVED 15 OCT 2004 PCT entry.  
Rec'd PCT/PTO 03 JAN 2005

NOTIFICATION OF TRANSMITTAL OF  
THE INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT

(PCT Rule 71.1)  
**10/519915**

Date of mailing  
(day/month/year)

15.10.2004

Applicant's or agent's file reference  
W0243WO ✓

## IMPORTANT NOTIFICATION

International application No.	International filing date (day/month/year)	Priority date (day/month/year)
PCT/EP 03/07798	26.06.2003	03.07.2002

Applicant  
**CROWN CORK & SEAL TECHNOLOGIES CORPORATION**

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.
4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/AB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international preliminary examining authority:



European Patent Office - P.B. 5818 Patentlaan 2  
NL-2280 HV Rijswijk - Pays Bas  
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Fax: +31 70 340 - 3016

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## PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT  
(PCT Article 36 and Rule 70)

Applicant's or agent's file reference W0243WO	<b>FOR FURTHER ACTION</b>	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/EP 03/07798	International filing date (day/month/year) 26.06.2003	Priority date (day/month/year) 03.07.2002
International Patent Classification (IPC) or both national classification and IPC B65D65/46		
Applicant CROWN CORK & SEAL TECHNOLOGIES CORPORATION		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.
  - This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 7 sheets.
3. This report contains indications relating to the following items:
  - I  Basis of the opinion
  - II  Priority
  - III  Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
  - IV  Lack of unity of invention
  - V  Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
  - VI  Certain documents cited
  - VII  Certain defects in the international application
  - VIII  Certain observations on the international application

Date of submission of the demand 21.11.2003	Date of completion of this report 15.10.2004
Name and mailing address of the International preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer Bridault, A Telephone No. +31 70 340-3224



**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No.

PCT/EP 03/07798

**I. Basis of the report**

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, Pages**

1-4, 6	as originally filed
5, 7, 8	received on 03.05.2004 with letter of 28.04.2004

**Claims, Numbers**

1-12	received on 03.05.2004 with letter of 28.04.2004
------	--

**Drawings, Sheets**

1/4-3/4	as originally filed
4/4	received on 03.05.2004 with letter of 28.04.2004

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- the language of publication of the international application (under Rule 48.3(b)).
- the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- contained in the international application in written form.
- filed together with the international application in computer readable form.
- furnished subsequently to this Authority in written form.
- furnished subsequently to this Authority in computer readable form.
- The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- the description,        pages:
- the claims,           Nos.:
- the drawings,        sheets:

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/EP 03/07798

5.  This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

**1. Statement**

Novelty (N)	Yes: Claims	1-12
	No: Claims	
Inventive step (IS)	Yes: Claims	1-12
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-12
	No: Claims	

**2. Citations and explanations**

**see separate sheet**

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

Reference is made to the following documents:

- D1: WO 01/83668 A
- D2: EP-A-0 593 952
- D3: GB-A-2 356 842
- D4: WO 01/36290 A

D1, D2, D3 and D4 all disclose containers from which the subject-matter of claim 1 differs by the features of the characterising part.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

The problem to be solved by the present invention may be regarded as releasing the container contents more quickly.

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT), since no prior art document suggests to have a releasable part of the container wall connected to the remainder of said wall by a part which dissolves more quickly, thereby enabling the releasable part to be released as soon as said quickly dissolving part has been dissolved.

Claims 2-12 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

Where a container has several walls, the term "wall" can refer to any one or more of the walls. A spherical container, for example, has a single wall whereas a cube has six walls. The term is therefore generic and could 5 refer to any part of the material defining the chamber.

The present invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:

Fig 1 is a perspective view of a housing formed as 10 part of a container according to a first embodiment;

Fig 2 is a section along line II - II of Fig 1,

Fig 3 shows the housing of Fig 2 with a lid component attached;

Fig 4 shows the container of Fig 3 following an 15 initial exposure to water;

Fig 5 is a section through a container according to an alternative embodiment;

Fig. 6 is a section of a container according to an alternative embodiment; and

Referring first to Figs 1 and 2 there is shown a 20 housing 10 of generally parallelopiped shape comprising a base wall 11, side walls 12, 13 and end walls 14, 15. The housing is hollow and is open opposite the base 11 to form a tray-like structure. The housing 10 is formed 25 from a water-soluble material. The material could be, for example, a grade of PVOH which dissolves at approximately 50°C. The interior of the housing 10 is divided into two discrete chambers 30, 31 by spaced

dissolution temperature of the container material. As the container 1 begins to dissolve the material thinned regions 20, 27 will completely dissolve before the remainder of the container. As a result, the panels 19,  
5 26 are released from the lid 25 and the base wall 14 such that product can escape from the chamber 31. Of course the panels 19, 26 do not have to be completely released to be effective. For example the material thinned regions 20, 27 could extend part way round the panels 19, 26 such  
10 that the panels 19, 26 become flaps which hinge open. Product from the chamber cannot escape until the remainder of the container has dissolved.

Referring now to Fig 5 there is shown an alternative embodiment. In this embodiment two discrete chambers  
15 130, 131 are formed from two separate, hollow cube-shape housings 110a, 110b which are bonded together along adjacent side walls 112a, 112b. Each housing 110a, 110b is open along one side but closed by a lid 125a, 125b, in this embodiment sealed to the housings by adhesion. The  
20 lids 125a, 125b are formed from different grades of PVOH which dissolve at different rates, with the material of the lid 125a having the faster dissolution rate. In this embodiment therefore the lid 125a of the housing 110a dissolves before the lid of housing 110b, to allow its  
25 product to escape first.

Referring to Fig.6 there is shown a container 201 with a single chamber 230. A generally cuboid housing 210 comprises a base wall 211 and side walls 214, 215. An open side of the housing 210 is closed by a lid 225.

The lid 225 is held onto the housing 210 by a clip 220 extending from its periphery. The clip 220 engages under a bead 235 formed around the open side of the housing 210.

- 5       The clip 220 is thinner than the remainder of the container 201. Accordingly, in use of the container the clip 220 dissolves before the remainder of the container so that the bead 235 no longer retains the lid 225, and therefore allows the lid 225 to be released from the  
10      housing 210.

EPO - DG 1

03 05 2004

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CLAIMS:

1. A water-soluble container (1) comprising one or more discrete chambers (30, 31) for containing product, wherein at least part (20, 27) of a wall (11, 25) of each chamber is adapted to dissolve before the remainder of the chamber to allow product to escape, characterised in that the at least part (20, 27) of the wall (11, 25) adapted to dissolve before the remainder of each chamber defines a releasable part (19, 26), such that when the at least part of the wall dissolves the releasable part is released undissolved.
2. A container (1) according to Claim 1, wherein the releasable part is a panel (19, 26) and the at least part of the wall at least partly surrounds the panel, such that the panel is released when the part of the wall has dissolved.
3. A container (201) according to any preceding claim, wherein the at least part of the wall (225) comprises one or more clip elements (220) adapted to retain the releasable part (225) until dissolved.
4. A container (1) according to any preceding claim, wherein the at least part (20, 27) of the wall is thinner than the remainder of the container.

5. A container (1) according to Claim 4, wherein the material thinning (20, 27) is arranged on the interior surface of the chamber wall.
6. A container (1) according to any preceding claim, wherein the container is formed by injection moulding.
7. A container (1) according to any preceding claim, wherein at least part of the material from which the container is formed is a polyvinyl alcohol.
8. A container (1) according to any preceding claim, wherein at least part of the material from which the container is formed is a polylactic acid.
9. A container (1) according to any proceeding claim, wherein at least part of the material from which the container is formed is starch-based.
10. A container (1) according to any preceding claim, wherein the whole of the container is formed from the same material.
11. A container (1) according to any preceding claim, wherein the container is flexible.
12. A container according to any preceding claim, comprising two or more chambers, wherein each chamber has a releasable part and each releasable part dissolves at

different rates so that the products contained in the chambers are allowed to escape sequentially.

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(44)

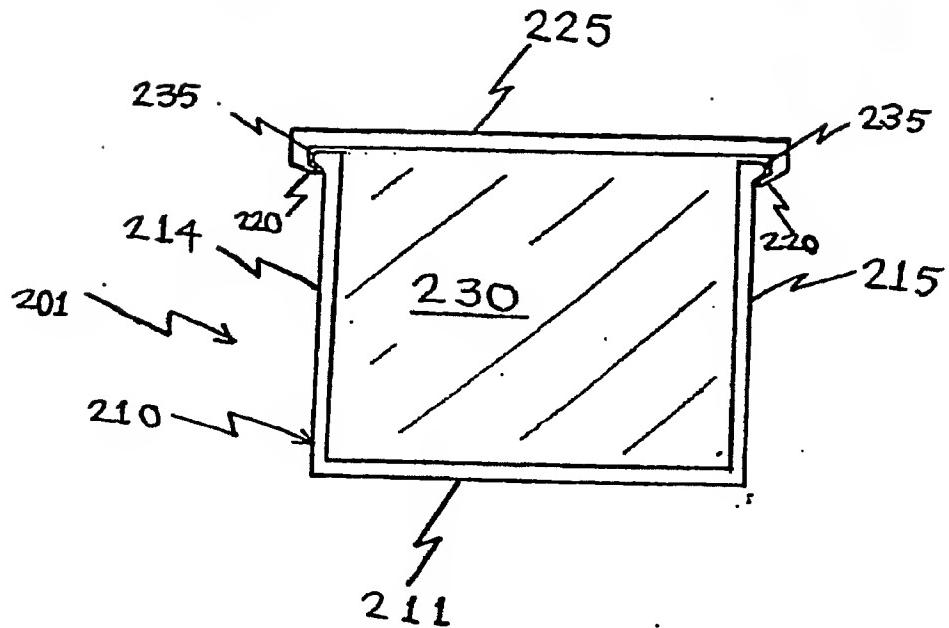


FIG 6

(19)



(11)

EP 1 663 809 B1

(12)

## EUROPEAN PATENT SPECIFICATION

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**15.10.2008 Bulletin 2008/42**

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**WO 2004/005156 (15.01.2004 Gazette 2004/03)**

### (54) WATER SOLUBLE CONTAINER

WASSERLÖSLICHER BEHÄLTER  
RECIPIENT SOLUBLE DANS L'EAU

(84) Designated Contracting States:  
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR  
HU IE IT LI LU MC NL PT RO SE SI SK TR**

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(43) Date of publication of application:  
**07.06.2006 Bulletin 2006/23**

(56) References cited:  
**EP-A- 0 593 952** WO-A-01/36290  
**WO-A-01/83668** WO-A-03/016165  
**DE-C- 809 896** GB-A- 2 356 842

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**Description**

[0001] The present invention relates generally to a water-soluble container.

[0002] Water-soluble containers as such are well-known and have a variety of uses, such as in clothes washing. For example, CA 1112534 describes a water-soluble container for a detergent composition. The water-soluble material may be, for example, polyvinyl alcohol (PVOH). This document describes a single chamber with a film form wall of constant thickness. Because the chamber wall is of constant thickness, the entire wall must be dissolved before any product can escape. In certain circumstances product may be required quickly, before the time when the entire container has dissolved. WO 01/83668, EP 593 952, GB 2 356 842 and WO 01/36290 all disclose prior art containers in accordance with the preamble of appended claim 1. According to the present invention there is provided a water-soluble container comprising one or more discrete chambers for containing product, wherein at least part of a wall of the or at least one of the chamber/s is adapted to dissolve before the remainder of the chamber to allow product to escape, characterised in that the at least part of the wall adapted to dissolve before the remainder of each chamber defines a panel and the at least part of the wall at least partly surrounds the panel, such that when the at least part of the wall dissolves the panel is either partly or completely released undissolved. This means that product can escape from a chamber without requiring complete dissolution of the chamber. This can be useful for decreasing the time taken for product to be released. It can also allow for a greater degree of control over when product is released because the area required to be dissolved is reduced.

[0003] A container according to the present invention for a system combining the advantage of not requiring a whole chamber to dissolve before a product is released, together with the possibility of sequential release of products. In its simplest form a chamber provided with the means for allowing product to escape before complete dissolution could be associated with a chamber not having those means. More complicated systems could involve chambers which allow products to escape after different times before complete dissolution.

[0004] The ability of such containers to provide for sequential release of multiple products is extremely useful. For example, clothing washing usually includes a detergent stage and a stage later in the washing cycle in which a softening agent is introduced. Dish-washing sometimes includes a detergent stage and a separate rinsing stage. In many cases it would be preferable and sometimes essential for different stages of washing operations to be kept completely separate.

[0005] By providing for sequential release of products the present invention removes the need for manual intervention at different stages of washing cycles and allows the complete washing product to be packaged and

supplied together.

[0006] The at least part of the wall will most usually be an exterior surface of the container thereby releasing product from the container when it dissolves. However, it is also possible that the at least part of the wall forms part of a chamber which is housed within another chamber, which itself includes water, whereby the contents of the chambers are mixed when the at least part of the wall dissolves. This might be useful, for example, if the product in the inner chamber is activated by product in the outer chamber. This allows activation in a controlled environment before the activated product is released into the exterior of the container and could be useful for products which become unstable once activated.

[0007] There are many ways in which the container could be formed in order that product is released from the chamber when the part of the wall dissolves.

[0008] The part of the wall may comprise one or more clip elements, such as a hook. The clip elements initially clip the closure part to the container but then dissolve and release the releasable panel. In this way only a small section of the wall dissolves and yet a large opening can be provided quickly.

[0009] There are many ways in which the part of the wall could be formed in order that it dissolves before the remainder of the container. For example, the at least part of the wall could be made from a thinner section of material and/or from a different material with a faster rate of dissolution than the remainder of the container.

[0010] In embodiments where the at least part of the wall is thinner than the remainder of the container the material thinning may be arranged on the interior surface of the chamber wall. This is particularly relevant when the at least part of the wall defines a thin channel, because if the material thinning was arranged on the exterior surface the channel could become saturated with dissolved material, which would impede further dissolution.

[0011] In order to simplify production and allow for high volume production the container may be formed by injection moulding. In embodiments where the at least part of the wall is a thin section surrounding a panel, the area of the panel may form the gate region for injection moulding. This ensures that the thin section is correctly moulded by avoiding problems with moulded regions which are remote from the injection point.

[0012] As stated above, differential dissolution characteristics may be achieved by forming the container from two or more different materials at least some of which are water-soluble. It may, however, be preferable for simplification of the production process for the whole of the container to be formed from the same material.

[0013] In some embodiments at least part of the material from which the container is formed is a polyvinyl alcohol. Alternatively at least part of the material may be a polylactic acid or a starch based material.

[0014] The container may be flexible. This may be as a result of the choice of material and/or the thickness of the walls.

[0015] Where a container has several walls, the term "wall" can refer to any one or more of the walls. A spherical container, for example, has a single wall whereas a cube has six walls. The term is therefore generic and could refer to any part of the material defining the chamber.

[0016] The present invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:

Fig 1 is a perspective view of a housing formed as part of a container according to a first embodiment; Fig 2 is a section along line II - II of Fig 1,

Fig 3 shows the housing of Fig 2 with a lid component attached;

Fig 4 shows the container of Fig 3 following an initial exposure to water;

Fig 5 is a section through a container according to an alternative arrangement not covered by the appended claims; and

Fig 6 is a section of a container according to an alternative embodiment.

[0017] Referring first to Figs 1 and 2 there is shown a housing 10 of generally parallelepiped shape comprising a base wall 11, side walls 12,13 and end walls 14,15. The housing is hollow and is open opposite the base 11 to form a tray-like structure. The housing 10 is formed from a water-soluble material. The material could be, for example, a grade of PVOH which dissolves at approximately 50°C. The interior of the housing 10 is divided into two discrete chambers 30, 31 by spaced parallel partition side walls 16, 17 which extend from end wall 15 and are joined at their ends by a partition end wall 18. Each of the partition walls 16, 17, 18 extends the full height of the housing walls 11, 12, 13, 14, 15. The portion of the base wall 14 which is bounded by the partition walls 16, 17, 18 includes a panel 19 surrounded by a region of material thinning 20 the purpose of which will be described in more detail below.

[0018] Referring now to Fig 3 the housing of Figs 1 and 2 is shown forming part of a container 1. The housing 10 is closed by a lid 25. The chambers 30, 31 are filled with different products before the lid 25 is applied. The lid 25 includes a panel 26 and region of material thinning 27 opposite and identical to those of the housing 10. The lid 25 may be secured to the housing 10 by any convenient means such as welding adhesion, interference fit or clipping. In this embodiment the seal is a face seal bond which is chemically activated, in this case by water, and supported internally by a wall 28 depending from the lid 25.

[0019] In this embodiment the thickness of the housing walls and the lid is approximately 0.4mm. This is about the thinnest that material can be without a risk of 'pin holes' i.e. tiny holes in the material which could compromise the integrity of the chamber. The material thinnings are approximately 0.15mm thick and are formed by reducing a small part of the uniform thickness of the con-

tainer.

[0020] In use, the container 1 is placed in an aqueous environment and the temperature is raised beyond the dissolution temperature of the container material. As the container 1 begins to dissolve the material thinned regions 20, 27 will completely dissolve before the remainder of the container. As a result, the panels 19, 26 are released from the lid 25 and the base wall 14 such that product can escape from the chamber 31. Of course, the panels 19, 26 do not have to be completely released to be effective. For example the material thinned regions 20, 27 could extend part way round the panels 19, 26 such that the panels 19, 26 become flaps which hinge open. Product from the chamber cannot escape until the remainder of the container has dissolved.

[0021] Referring now to Fig 5 there is shown an alternative arrangement. In this arrangement two discrete chambers 130, 131 are formed from two separate, hollow cube-shape housings 110a, 110b which are bonded together along adjacent side walls 112a, 112b. Each housing 110a, 110b is open along one side by closed by a lid 125a, 125b in this embodiment sealed to the housings by adhesion. The lids 125a, 125b are formed from different grades of PVOH which dissolve at different rates, with the material of the lid 125a having the faster dissolution rate. In this embodiment therefore the lid 125a of the housing 110a dissolves before the lid of housing 110b, to allow its product to escape first.

[0022] Referring to Fig 6 there is shown a container 201 with a single chamber 230. A generally cuboid housing 210 comprises a base wall 211 and side walls 214, 215. An open side of the housing 210 is closed by a lid 225.

[0023] The lid 225 is held onto the housing 210 by a clip 220 extending from its periphery. The clip 220 engages under a bead 235 formed around the open side of the housing 210.

[0024] The clip 220 is thinner than the remainder of the container 201. Accordingly, in use of the container 201 the clip 220 dissolves before the remainder of the container so that the bead 235 no longer retains the lid 225, and therefore allows the lid 225 to be released from the housing 210.

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## Claims

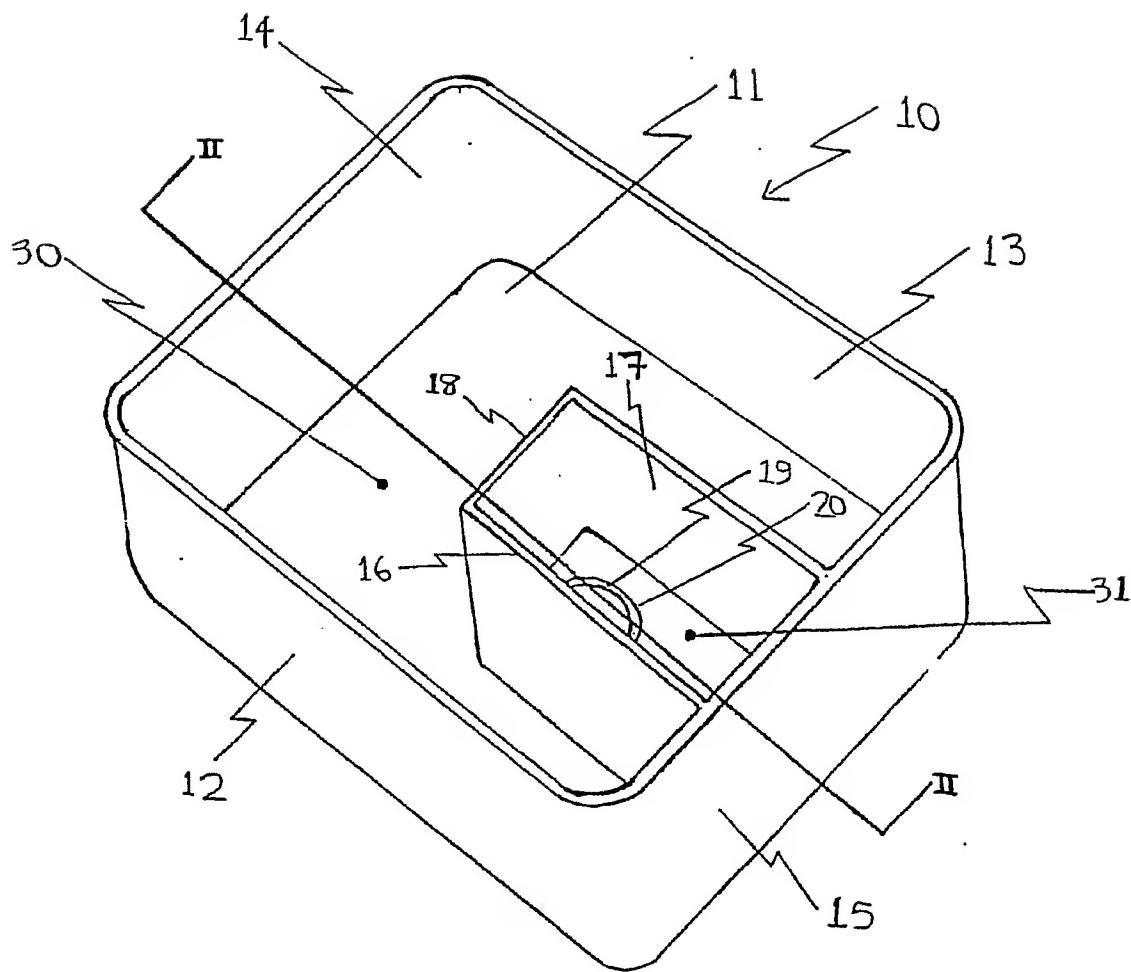
1. A water-soluble container (1) comprising one or more discrete chambers (30, 31) for containing product, wherein at least part (20, 27) of a wall (11, 25) of the or at least one of the chamber/s is adapted to dissolve before the remainder of the chamber to allow product to escape,  
characterised in that

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55  
the at least part (20, 27) of the wall (11, 25) adapted to dissolve before the remainder of each chamber defines a panel (19, 26) and the at least part of the wall at least partly surrounds the panel, such that

- when the at least part of the wall dissolves the panel is either partly or completely released undissolved.
2. A container (201) according to Claim 1, wherein the at least part of the wall (225) comprises one or more clip elements (220) adapted to retain the panel (225) until dissolved. 5
3. A container (1) according to Claim 1 or Claim 2, wherein the at least part (20, 27) of the wall is thinner than the remainder of the container. 10
4. A container (1) according to Claim 3, wherein the material thinning (20, 27) is arranged on the interior surface of the chamber wall. 15
5. A container (1) according to any preceding claim, wherein the container is formed by injection moulding. 20
6. A container (1) according to any preceding claim, wherein at least part of the material from which the container is formed is a polyvinyl alcohol. 25
7. A container (1) according to any preceding claim, wherein at least part of the material from which the container is formed is a polylactic acid. 30
8. A container (1) according to any preceding claim, wherein at least part of the material from which the container is formed is starch-based. 35
9. A container (1) according to any preceding claim, wherein the whole of the container is formed from the same material. 40
10. A container (1) according to any preceding claim, wherein the container is flexible. 45
11. A container according to any preceding claim, comprising two or more chambers, wherein each chamber has a panel and the at least parts of the wall for each panel dissolve at different rates so that the products contained in the chambers are allowed to escape sequentially. 50
- Patentansprüche**
1. Wasserlöslicher Behälter (1) bestehend aus einer oder mehreren ein Produkt enthaltenden eigenständigen Kammern (30, 31), wobei mindestens ein Teil (20, 27) einer Wand (11, 25) der Kammer/n so beschaffen ist, dass er sich vor dem Rest der Kammer auflöst, damit das Produkt auslaufen kann, **dadurch gekennzeichnet, dass** mindestens ein Teil (20, 7) der Wand (11, 25) so ausgebildet ist, dass er sich auflöst, bevor der Rest 55
- jeder Kammer eine Platte (19, 26) bildet und mindestens ein Teil der Wand die Platte zumindest teilweise umgibt, sodass mindestens ein Teil der Platte entweder teilweise oder ganz in ungelöster Form freigegeben wird, wenn sich mindestens ein Teil der Wand auflöst. 60
2. Behälter (201) gemäß Anspruch 1, **dadurch gekennzeichnet, dass** mindestens ein Teil der Wand (225) ein oder mehrere Klemmelemente (220) aufweist, die so eingerichtet sind, dass sie die Platte (22) bis zur Auflösung festhalten. 65
3. Behälter (1) gemäß Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** mindestens ein Teil (20, 27) der Wand dünner ist als der Rest des Behälters. 70
4. Behälter (1) gemäß Anspruch 3, **dadurch gekennzeichnet, dass** die dünneren Stellen (20, 27) des Materials an der Innenfläche der Kammerwand angeordnet sind. 75
5. Behälter (1) gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der Behälter im Spritzgießverfahren geformt wird. 80
6. Behälter (1) gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** mindestens ein Teil des Materials, aus dem der Behälter geformt ist, Polyvinylkohol darstellt. 85
7. Behälter (1) gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** mindestens ein Teil des Materials, aus dem der Behälter geformt ist, eine Polyaktidsäure darstellt. 90
8. Behälter (1) gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** mindestens ein Teil des Materials, aus dem der Behälter geformt ist, stärkebasiert ist. 95
9. Behälter (1) gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der gesamte Behälter aus demselben Material geformt ist. 100
10. Behälter (1) gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der Behälter flexibel ist. 105
11. Behälter gemäß einem der vorhergehenden Ansprüche mit zwei oder mehreren Kammern, **dadurch gekennzeichnet, dass** jede Kammer eine Platte aufweist und dass sich mindestens Teile der Wand jeder Platte zu verschiedener Zeit auflösen, sodass die in den Kammern enthaltenen Produkte der Reihe nach freigegeben werden können. 110

**Revendications**

1. Récipient soluble dans l'eau (1) comprenant une ou plusieurs chambres discrètes (30, 31) pour contenir un produit, dans lequel au moins une portion (20, 27) d'une paroi (11, 25) de la ou des chambre(s) ou d'une au moins parmi les chambres est apte à se dissoudre avant le reste de la chambre pour permettre au produit de s'échapper,  
**caractérisé en ce que**  
la au moins une portion (20, 27) de la paroi (11, 25) apte à se dissoudre avant le reste de chaque chambre définit un panneau (19, 26) et la au moins une portion de la paroi entoure au moins partiellement le panneau, de sorte que le panneau soit partiellement ou entièrement libéré sans être dissout lorsque la au moins une portion de la paroi se dissout.
2. Récipient (201) selon la revendication 1, dans lequel la au moins une portion de la paroi (225) comprend un ou plusieurs éléments d'agrafage (220) qui est apte à retenir le panneau (225) jusqu'à dissolution.
3. Récipient (1) selon la revendication 1 ou la revendication 2, dans lequel la au moins une portion de la paroi (20, 27) est plus mince que le reste du récipient.
4. Récipient (1) selon la revendication 3, dans lequel l'amincissement du matériau (20, 27) est situé sur la surface intérieure de la paroi de la chambre.
5. Récipient (1) selon l'une des revendications précédentes, dans lequel le récipient est formé par moulage par injection.
6. Récipient (1) selon l'une des revendications précédentes, dans lequel au moins une partie du matériau dans lequel le récipient est formé est un polyalcool de vinyle.
7. Récipient (1) selon l'une des revendications précédentes, dans lequel au moins une partie du matériau dans lequel le récipient est formé est un acide polylactique.
8. Récipient (1) selon l'une des revendications précédentes, dans lequel au moins une partie du matériau dans lequel le récipient est formé est amylacée.
9. Récipient (1) selon l'une des revendications précédentes, dans lequel l'intégralité du récipient est formée avec le même matériau.
10. Récipient (1) selon l'une des revendications précédentes, dans lequel le récipient est flexible.
11. Récipient selon l'une des revendications précédentes, comprenant deux chambres ou davantage, dans lequel chaque chambre possède un panneau et les au moins une portion de la paroi de chaque panneau se dissolvent selon différents taux, de sorte que les produits contenus dans les chambres puissent s'échapper séquentiellement.



**FIG 1**

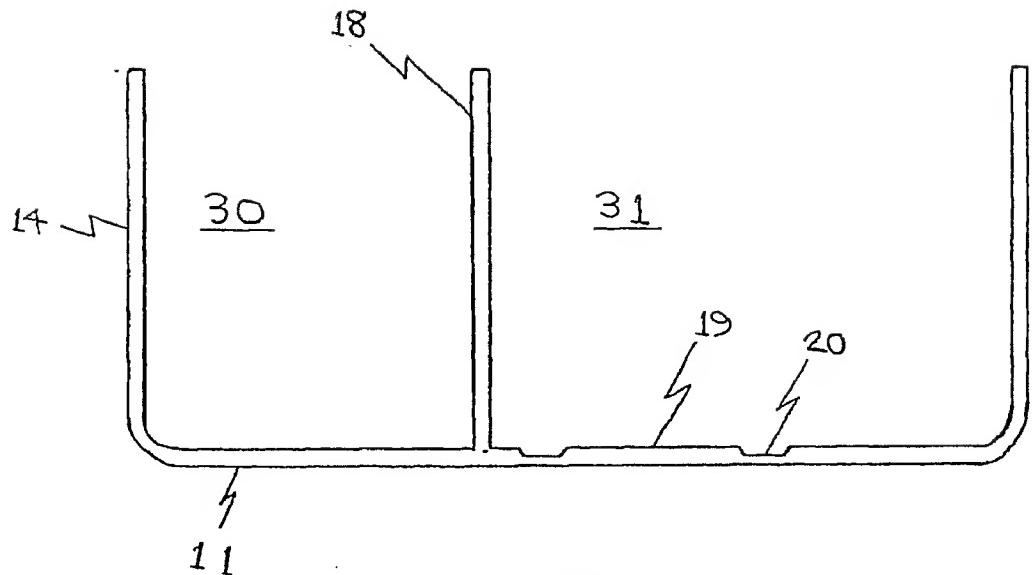


FIG 2

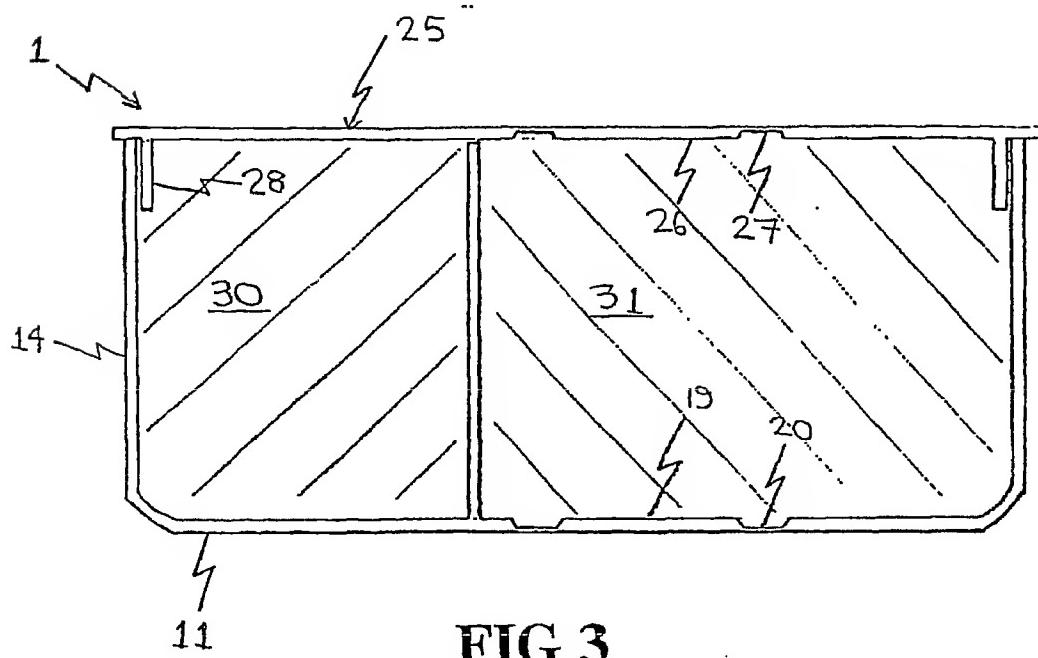
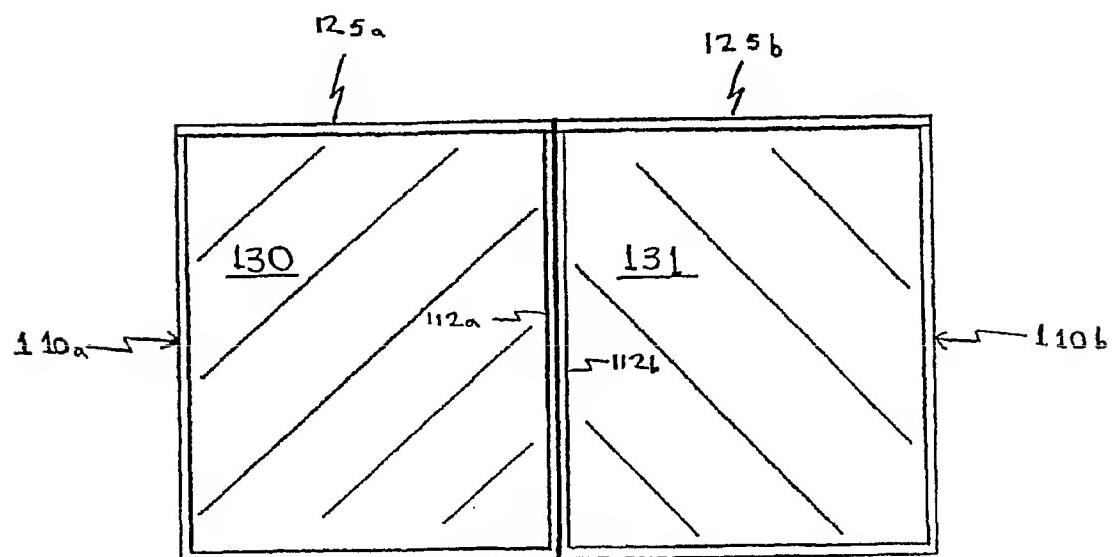
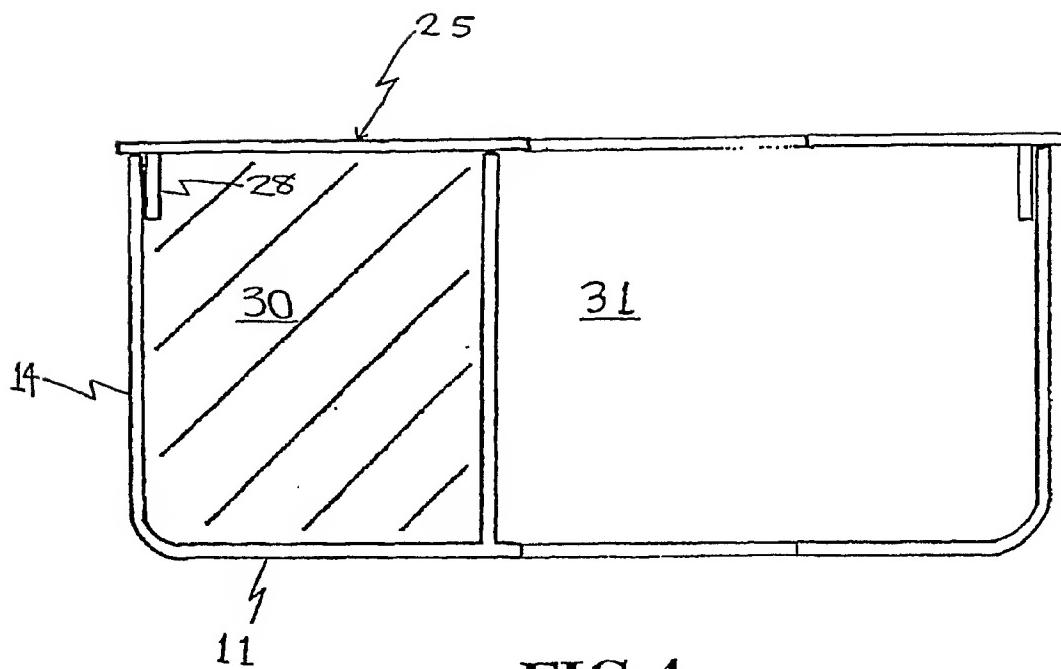
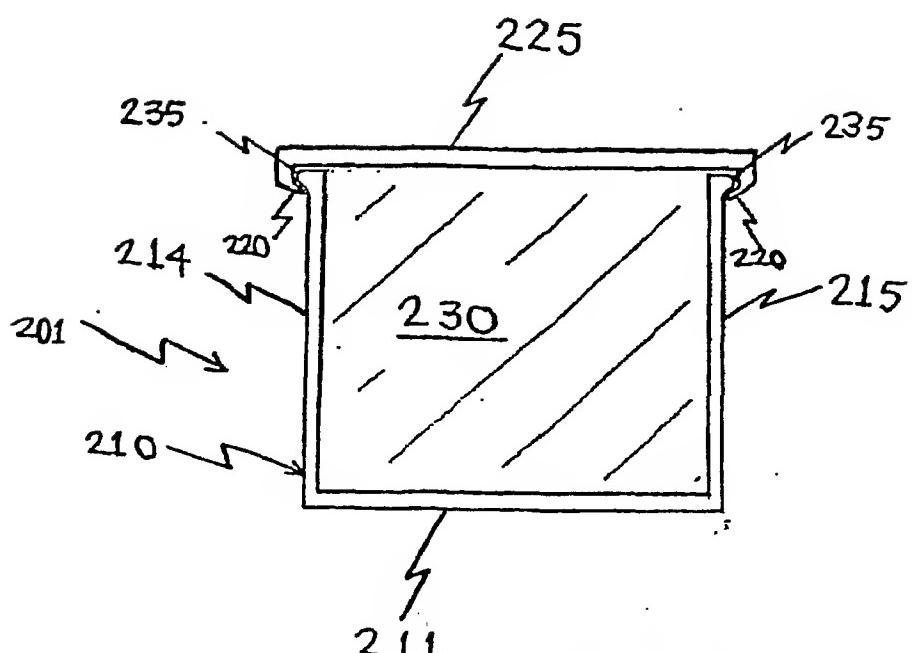


FIG 3





**FIG 6**

**REFERENCES CITED IN THE DESCRIPTION**

*This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.*

**Patent documents cited in the description**

- CA 1112534 [0002]
- WO 0183668 A [0002]
- EP 593952 A [0002]
- GB 2356842 A [0002]
- WO 0136290 A [0002]

## Grounds of Opposition to EP 1663809

Statement of facts and arguments of Opposition to European Patent No. 1663809 B1, granted to Obrist Closures Switzerland GmbH on October 15, 2008 and corresponding to European patent application No.03762682.7. The Patent is opposed in its entirety.

Opposition submitted by the Procter & Gamble Company.

### EP 1 663 809

EP 1 663 809 was filed on June 8, 2003 was granted with eleven claims consisting of one independent claim (claim 1) and ten dependent claims (claims 2-11), hereinafter referred to as the Patent. The Patent claims priority from an earlier European patent application filed on July 7, 2002, EP 02254680.

Independent claim 1 of the patent relates to a water-soluble container comprising one or more discrete chambers for containing product, wherein at least part of the wall of the or at least one of the chamber/s is adapted to dissolve before the remainder of the chamber to allow the product to escape, characterised in that at least part of the wall adapted to dissolve before the remainder of each chamber defines a panel and at least part of the wall at least partly surrounds the panel, such that when at least part of the wall dissolves the panel is either partly or completely released undissolved.

Dependent claims 2-11 relate to different embodiments of the alleged invention.

### The problem as defined by the description of EP 1 663 809

The subject matter of the patent relates to the problem of providing a water-soluble container comprising one or more discrete chambers to provide the sequential release of multiple products, without requirement of complete dissolution of the water-soluble container.

The solution described is to provide a water-soluble container comprising one or more discrete chambers wherein at least part of the wall of the chamber or at least one of the chambers is adapted to dissolve before the remainder of the wall or chamber, to allow the product to escape, without requiring the complete dissolution of the water-soluble container.

### Claim interpretation

The claim seems oddly written and thus requires some level of interpretation in order to fully understand its meaning.

The claim requires that at least part of the wall or at least one of the chamber/s is adapted to dissolve before the remainder of the chamber to allow the product to escape. By way of example the patentee offers that the wall, at this point, is made from a thinner or a different material having different dissolution

properties than the remainder or the wall or chamber so as to dissolve first. This part of the wall adapted to dissolve before remainder of each chamber defines a panel, but only at least partly surrounds the panel. Hence part of the wall, which is made from thinner or different material, having different dissolution properties will define a panel, however the fast dissolving wall does not need to surround the panel. Hence a line or point of weakness is envisaged.

### Sufficiency

The patent alleges a sequential release of multiple products from a water-soluble container comprising one or more chambers by having at least part of a wall or chamber adapted to dissolve before the remainder of the chamber. Allegedly the at least part of the wall is formed by thinning the material or by forming part of the wall with a different material having different dissolution properties. The material thinning in the walls is described in the patent to be done by reducing a small part of the uniform thickness of the container (Figure 3, parts 20 and 27). However there is no example and no description of how such reduction is to be achieved. Moreover there is no example and no description of how such container can be formed from different materials.

It is therefore submitted that the patent does not describe the alleged invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

### Prior Art

The Opponent will show that the patent lacks novelty and inventive step in view of the prior art listed below:

- D1: EP 1 161382 (Unilever PLC)
- D2: WO 01/83668 (Procter & Gamble Company)
- D3: GB 2 375 516 (Reckitt Benkiser UK Limited)
- D4: WO 03/016165 (Warner-Lambert Company)

### Lack of Novelty

#### Lack of Novelty in view of D1

D1 relates to a water-soluble package comprising a fluid substance which is released on dissolution of the package. The water-soluble package is made by thermoforming the water-soluble film.

D1 as a whole discloses a water-soluble container. Page 6, paragraph [0031] describes thermoforming generally and the fact that film thinning always takes place on thermoforming. Page 5, paragraph [0027] of D1 even describes, by way of a diagram, which parts of the package are thinner. Hence, when referring to the patent, corners (D) and horizontal edges (C) form "the at least part of the wall". Since the corners dissolve first, the package then release center base (E), which thus forms the panel (see page 5, paragraph [0027]). Areas C and D of D1 surround area E completely.

It is therefore submitted that the D1 describes the features of the Patent and the Patent therefore lacks novelty over the disclosure of D1.

#### Lack of Novelty in view of D2

D2 relates to free-flowing compositions in a pouch having one or more compartments. The pouch is made of water-soluble stretchable material.

D2 as a whole discloses a water-soluble container. At page 7, lines 29-32 and page 8, lines 2-6 D2 discloses thinning of the water-soluble film. Page 11, lines 10-19 discloses coating of the film with a substance designed to delay dissolution. The coated film is then stretched and coating is cracked. This arrangement therefore forms a film with multiple "at least parts of the wall" and panels, which are formed from the areas of film which are coated.

It is therefore submitted that D2 describes the features of the Patent and therefore the Patent lacks novelty over the disclosure of D2.

#### Lack of Novelty in view of D3

D3 relates to a water-soluble injection moulded container comprising a receptacle part and a sealing part which are joined together by a hinge part.

D3 discloses a water-soluble injection moulded container. Page 9, lines 1-15 of D3 disclose thickness differences for different parts of the container. Page 9, lines 16-17 then goes on to explain that the sealing part dissolves preferably in water before the receptacle part. Page 10, lines 26 – 32 and page 11, lines 1-3 of D3 describe the hinge part. The hinge part is equivalent to "the at least part of the wall" of the patent. Hence the sealing part forms a panel (see page 10 line 26).

D3 describes different thicknesses for the receptacle, sealing and hinge part. In one embodiment the hinge part is the thinnest part and therefore forms "the at least part of the wall". The hinge partly surrounds the second thinnest, sealing part, which therefore forms the panel. Dissolution of the hinge part will fully or partially release the sealing part.

It is therefore submitted that D3 describes the features of the Patent and therefore the Patent lacks novelty over the disclosure of D3.

#### Lack of Novelty in view of D4

D4 relates to a water-soluble package comprising one or more chambers containing product.

D4 as whole discloses partially or completely water-soluble packaging for sequential release of substances. Page 7, lines 26-28, page 8, lines 1-4 and page 12, lines 14-22 of D4 discloses thickness differences and different packaging material for different parts of the container. Page 19, lines 10-13 of D4 describes an easy dissolving packaging material band (13), which therefore forms "the at least part of the wall" according to the patent. The capsule walls (11d) therefore form the panels.

In one embodiment (figures 1e and 1f) the easy dissolving packaging material band (13) is adapted to dissolve prior to the remainder of the chamber. The easy dissolving packaging material band (13) forms "the at least part of the wall" and defines the panels (11d). Dissolution of easy dissolving packaging material band (13) will fully or partially release capsule walls (11d).

It is therefore submitted that D4 describes the features of the Patent and therefore the Patent lacks novelty over the disclosure of D4.

### **Lack of Inventive Step**

The technical problem addressed by the Patent is to provide a water-soluble container comprising one or more discrete chambers to provide a sequential release of multiple products, without the requirement of complete dissolution of the water-soluble container.

The patent allegedly solves the problem describing at least part of a wall, which is adapted to dissolve before the remainder of the wall or the chamber. "The at least part of the wall" defines a panel by surrounding the panel partially or completely. When the "at least part of the wall" dissolves, the panel is either partly or completely released, undissolved, to release the product from the water-soluble container.

The claims of the patent are found to lack inventive step over the documents discussed above.

Taking this technical problem as the starting point for the "problem-solution" approach to inventive step, it is submitted that D1 should be taken as the closest prior art because D1, is also concerned with a water-soluble container to provide a release of product. Additionally document D2 also solves the same technical problem.

Document D1 provides water-soluble package, and discloses the same features as the Patent to provide sequential release of the product. When the water-soluble package according to D1 is in water, the corners (D) and horizontal edges (C) dissolve first and release the centre base E either in full or partially to release the liquid from the water-soluble package.

It is thus respectfully submitted that a skilled person starting from D1 would have arrived at the alleged invention as claimed in the patent without any inventive activity. It is therefore submitted that the Patent lacks inventive step over the disclosure of D1.

Alternatively, we can start from D2 as the closest prior art. Document D2 provides water-soluble pouch, and discloses the same features as the Patent (at least parts of the walls and panels) to provide sequential release of the product. D2 describes how water penetrates through or dissolves the thinnest parts of the pouch first, releasing the content of the pouch without the need for the complete dissolution of the pouch. Additionally when thinner areas between the panels dissolve first, the panels in between are released, releasing the liquid from the pouch.

It is thus respectfully submitted that a skilled person starting from D2 would have arrived at the alleged invention as claimed in the patent without any inventive activity. It is therefore submitted that the Patent lacks inventive step over the disclosure of D2.

D1 and D2 both solve the same technical problem in the same way as the Patent. Therefore there is no difference between that which is discussed in the prior art and the patent, and thus there can be no objective problem and, equally, no invention.

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**PAGES: 12**  
**CONFIRMATION BY POST**

22 February 2010

Dear Sirs

**RE: European Patent No. EP1663809**  
**Applicant: Obrist Closures Switzerland GmbH**  
**Our File: PO3038EP93**

In response to the communication of Notice of Opposition dated 12 October 2009 we file herewith the following observations.

**Main Request**

We request maintenance of the patent as granted without amendment.

It is submitted that independent Claim 1 is novel and inventive over D1 to D4.

**D1**

It is argued by the opponent that the corners (C, D), which are described as undesirable, would dissolve first to release the centre base (E). It is submitted that it is not certain in all circumstances covered by Claim 1 of the granted patent that thinner regions will dissolve first; for example the type of material and the shape of the regions will affect their solubility. Therefore, when applied to Claim 1 of the granted patent, it is not inevitable that the base (E) of D1 will be released undissolved.

Furthermore, Claim 1 of the granted patent specifies that the panel is defined by at least part of the chamber which is adapted to dissolve before the remainder of the chamber. It is noted that containers formed in accordance with the present invention (for example as shown in the drawings) might also have corners present as a result of the production process. Therefore, when interpreting the granted patent in the light of D1 the skilled man would realise that the corners per se are not adapted to dissolve before the remainder of the container and that therefore the parts of the wall defining the panel must comprise something additional to features arising inevitably as a result of production. Therefore, it is submitted that, even if the corners described in D1 dissolve first to release the panel this would not constitute at least part of a wall which is adapted to dissolve before the remainder of a chamber to define a panel.

Moreover, because the corners of D1 are defined as undesirable it is submitted that the skilled man would not be motivated to use D1 if he was to modify it to form a specific and deliberate panel-defining section. Therefore it is submitted that Claim 1 is inventive over D1.

## **D2**

It is submitted that D2 does not describe a chamber which will release any panels. Furthermore, the purpose of D2 is to delay dissolution which is contrary to the present invention, where dissolution of the panel-defining region is required in order for the panel to be released.

## **D3**

It is submitted that D3 is not relevant to the present invention. The hinge is removed after sealing and in any event dissolving of the hinge does not release the sealing part. Therefore, the sealing part does not form a panel which will be released undissolved to allow product escape before the remainder of the container dissolves.

## **D4**

It is submitted that D4 does not describe a panel which will be released undissolved. The container is formed from two or more parts and, whilst different parts of the container may have different thicknesses relative to each other, there is no localised thinning providing panel-defining sections which will drop out undissolved.

### **First Auxiliary Request**

Claim 1 has been amended to specify two or more discrete chambers and sequential release of product from the chambers at different times. Support for the introduction of these features is to be found in figures 1 to 5 of the specification as filed and the accompanying description; and in paragraphs 3 to 5 of the granted specification (present on filing).

It is submitted that none of documents D1 to D4 discloses a sequentially releasing container in which one or more drop-out panels are used to cause release of products from discrete chambers after different times.

The arguments submitted in support of the Main Request are also relevant.

### **Second Auxiliary Request**

Claim 1 has been amended to introduce the limitation that the container is formed by injection moulding. Support for the introduction of this feature is to be found in paragraph 11 of the granted specification (present on filing). Claim 11 is newly introduced and specifies that the area of the panel forms the gate region for the injection moulding. Support for the introduction of this claim is to be found in paragraph 11 of the granted specification (present on filing).

The arguments submitted in support of the Main Request are also relevant to this Request.

### **Third Auxiliary Request**

Claim 1 has been amended in the following ways: 1. ) The container comprises at least two discrete chambers - support for the introduction of this feature is to be found in the drawings and accompanying description and also in paragraphs 3 to 5 of the granted specification (also present in the specification as filed); 2.) The soluble wall portion surrounds the panel - support for the introduction of this feature is to be found, for example in paragraph 20 of the granted specification (also present on filing); 3.) The panel is released from the remainder of the chamber - support for the introduction of this feature is to be found in paragraph 20 of the granted specification (also present on filing).

The arguments submitted in support of the Main Request are also relevant to this Request.

**Sufficiency**

It is submitted that the patent describes the invention in a manner such that it could be carried out by persons skilled in the art. All of the requirements noted by the opponent would be self-evident to the person skilled in the art and in fact likely form part of the common general knowledge. For example, forming containers with non-uniform thicknesses is well known in the art, such as by well-known moulding techniques:

**Reservations**

We reserve the right to make amendments to any of the Requests filed herewith and request that we be allowed to file further Requests if necessary; and that we be allowed to cancel claims and/or combine any one or more of the Requests.

If further facts and/or arguments are presented by the Opponent or the Opposition Division in consideration of the patent we hereby request an opportunity to consider and respond to such observations.

We respectfully request Oral Proceedings in the event that the Opposition Division is of the opinion that the opposed patent cannot be maintained.

Please acknowledge receipt of this letter and its enclosures by stamping and returning the enclosed EPO Form 1037.

Yours faithfully

**Dr Matthew Greenwood  
For and on behalf of  
BRYERS**

(19)



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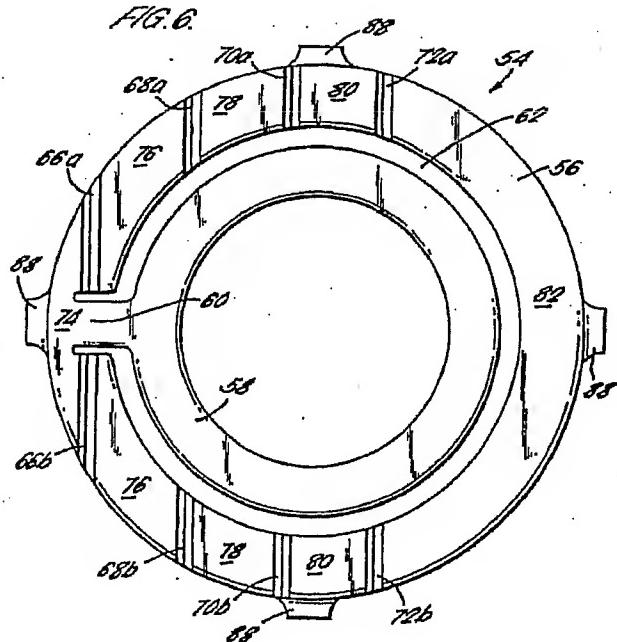
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### (54) Pull-tab

(57) There is described a pull-tab for use in removing a membrane adhered to a container (32). The container (32) defines an opening (40) having a periphery and the membrane overlies the opening (40) and is adhered to the periphery so as to prevent access to the contents of the container (32) via the opening (40) prior to the removal of the membrane. The pull-tab (54) comprises a peripheral portion having a shape correspond-

ing to at least a part of the periphery of the opening (40) and is joined to the membrane in a region approximate that part. A tab portion (58) is joined to the peripheral portion (56). The peripheral portion (56) comprises means (66, 68, 70, 72) to restrict a pulling force applied to the tab portion (58) from being substantially transmitted to all but a sector of the peripheral portion until such time as the membrane approximate that sector has been pulled away from the container (32).



## Description

[0001] The present invention relates to a pull-tab for use in releasing a membrane adhered to a container, the container defining an opening having a periphery and the membrane overlying the opening and being adhered to the periphery so as to prevent access to the contents of the container via the opening prior to the release of the membrane. The present invention also relates to a pull-tab in combination with such a membrane and to a pull-tab and membrane in combination with such a container.

[0002] It is known to package goods in plastics containers in which the plastics container is provided with an opening which is overlain by a plastics cap or other closure to provide resealable access to the contents of the container via the opening. It is also known to provide such a cap or closure with a foil liner which covers the opening and which is at least initially adhered to the container. The provision of such a liner serves not only to retain the freshness of the product packaged within the container but also serves to provide the consumer with evidence as to whether the container has been subject to unauthorised tampering since, under such circumstances, the foil liner will either no longer be adhered to the container or else will be compromised in some other way.

[0003] Typically, as shown in Figure 1, the foil liner 10 comprises a metallic substrate 12 which is coated on each of its opposing surfaces with a respective layer of adhesive 14,16. Each of the layers of adhesive 14,16 in turn adhere the metallic substrate 12 to a respective layer of polyethylene material 18,20. One of the layers of polyethylene material 18 is also bonded to a form layer 22 which provides a non-stick coating to one side of the foil liner 10.

[0004] The foil liner is adhered to the container by placing it over the opening with the form layer uppermost and holding it in close contact with the rim. The foil liner is then exposed to a time varying magnetic field which gives rise to eddy currents within the electrically conductive metallic substrate 12 and the generation of heat. This heat in turn melts the respective polyethylene layers 18 and 20 and bonds the foil liner to the container.

[0005] In order to first gain access to the contents of the container the foil liner must be removed and discarded. To this end it is known to provide the liner with a tab 24 which is not adhered to the container and which projects outwardly away from the underlying opening as shown in Figure 1. In order to remove the foil liner it is intended that the consumer pull the tab in such a way as to overcome the bond between the foil liner and the container. However, such tabs are small and typically difficult to grasp, particularly for the elderly and those with limited dexterity, and as a result it is has not always been possible to remove the foil liner in an easy and reliable manner.

[0006] In an attempt to overcome the difficulties as-

sociated with the tab arrangement shown in Figure 1, foil liners have also been designed of the type shown in Figure 2 which present a semi-circular pull-tab of increased surface area and which are consequently easier to grasp. The foil liners are stamped from a web of material shown in Figure 3 which, as before, comprises a metallic substrate 12 sandwiched between two layers

5 of adhesive 14 and 16 and, outside that, two layers of polyethylene material 18 and 20. One of the layers of polyethylene material 18 is again provided with a form layer 22 and it is here that the foil liner of Figure 2 differs from that of Figure 1. The form layer 22 comprises a laminate of two layers, the first of which 22a is adhered to the layer of polyethylene material 18 and the second of which 22b is adhered to the first layer 22a but only at opposite edge portions of the web 28a and 26b. In a central portion of the web 28 the second layer 22b is not adhered to the first layer 22a. Thus, by stamping out foil liners in such a way that approximately half the liner intersects the central portion of the web 28 and the other half intersects one of the two edge portions 26a or 26b it is possible to produce the liner shown in Figure 2 and which comprises a semi-circular pull-tab 24 comprising the non-adhered portion of the second form layer 22b.

[0007] Although this foil liner overcomes some of the difficulties of the much smaller tab arrangement shown in Figure 1, both suffer from the disadvantage that it is possible for a consumer to exert a pulling force on the tab in a direction which is by no means an efficient one if they are attempting to remove the foil from the container opening. This, again, can lead to a perceived unreliability and a lack of consumer confidence when it comes to the initial removal of the foil liner.

[0008] In US Patent No. 4,815,618 there is described a tamper indicating dispenser closure in which a membrane, in the form of a foil seal, overlies and is adhered to the perimeter of an opening in a container. However, rather than having an upper non-stick layer, the form layer of the previous arrangements is omitted and replaced by a plastics disc which is of slightly smaller surface area than the opening overlain by the membrane and which is adhered to the membrane at the same time as the membrane is adhered to the container. A pull-ring is attached to the disc and is arranged so that a pulling force applied to the pull-ring by a consumer is transmitted to an edge of the circular disc irrespective of the direction in which the consumer pulls on the pull-ring provided that that direction is generally away from the membrane. Because the edge of the disc is close to the edge of the membrane, the pulling force is said to ensure that substantially all of the membrane is removed. Nevertheless, it will be noted that the pulling force exerted by the consumer must be sufficient to simultaneously overcome the bond created between the membrane and the container at all points around the perimeter of the opening, a task which may be sufficient to defeat the attempts of certain consumers. Thus there still remains a need for a reliable means for removing foil liners and the like.

which does not prevent their use by the elderly or the infirm or consumers with reduced dexterity.

[0009] According to a first aspect of the present invention there is provided a pull-tab for use in removing a membrane adhered to a container, the container defining an opening having a periphery and the membrane overlying the opening and being adhered to said periphery so as to prevent access to the contents of the container via said opening prior to the removal of the membrane, the pull-tab comprising a peripheral portion having a shape corresponding to at least part of the periphery of said opening and being joined to the membrane in a region approximate said part and a tab portion joined to the peripheral portion, the peripheral portion comprising means to restrict a pulling force applied to the tab portion from being substantially transmitted to all but a first sector of the peripheral portion until such time as the membrane approximate said first sector has been pulled away from the container.

[0010] According to a second aspect of the present invention there is provided a closure assembly in combination with a container, the container defining an opening having a periphery and the closure assembly comprising a membrane and a pull-tab, the pull-tab being as described above.

[0011] A number of embodiments of the present invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a cross-sectional view of a foil liner of the prior art;

Figure 2 is a perspective view of another foil liner of the prior art;

Figure 3 is a cross-sectional view of a web from which the foil liner of Figure 2 is stamped;

Figure 4 is an exploded view of the components of a closure assembly in accordance with a first embodiment of the present invention;

Figure 5 is an enlarged cross-sectional view of a metallic foil of the closure assembly of Figure 4;

Figure 6 is a plan view of a pull-tab of the closure assembly of Figure 4;

Figure 7 is a plan view of a pull-tab in accordance with a second embodiment of the present invention;

Figure 8 is a cross-sectional view of a pull-tab in accordance with a third embodiment of the present invention;

Figure 9 is an enlarged cross-sectional view of a line of weakness extending through a peripheral portion of a pull-tab in accordance with a fourth embodiment of the present invention; and

Figure 10 is an enlarged cross-sectional view of a line of weakness extending through a peripheral portion of a pull-tab in accordance with a fifth embodiment of the present invention.

[0012] Referring to Figure 4 there is shown a neck 30 of a container 32. The remainder of the container 32 has

not been shown as its body shape may take any suitable form and may, for example, be of square, rectangular or circular cross-section and may have an integral handle formed as part of the body shape.

[0013] The neck 30 is provided on an external surface with engagement means 34 with which to engage complimentary engagement means (not shown) provided on a cap 36. In the example shown, the engagement means 34 comprise a helical thread configuration but other engagement means may also be provided. At an upper end, the neck 30 terminates in a rim 38 which in turn defines an opening 40. It is via this opening 40 that access is gained to the contents of the container 32 and through which the contents of the container are dispensed.

[0014] A circular disc known as a metallic foil 42 rests on rim 38 so as to overlie and close opening 40. As shown in more detail in Figure 5, the metallic foil 42 comprises an electrically conductive substrate 44 which is coated on each of its opposed surfaces with a respective layer of adhesive 46 and 48. Each of the adhesive layers 46 and 48 serve to bond the electrically conductive substrate 44 to a respective layer of polyethylene material 50 or 52. The result is a laminate structure with the electrically conductive substrate 44 sandwiched between two layers of polyethylene material 50 and 52.

[0015] A moulded plastics pull-tab 54 rests on an upper surface of the metallic foil 42 and is shown in plan view in Figure 6. The pull-tab comprises an annular peripheral portion 56 and, in the example shown, an annular tab portion 58 which is joined to the peripheral portion 56 by a tongue 60. The peripheral portion 56 is sized so as to overlie the rim 38 of the container 32 and accordingly has an external diameter substantially the same as that of the rim. The internal diameter of the peripheral portion 56 is substantially the same or slightly smaller than the diameter of the opening 40.

[0016] The tab portion 58 is sized so as to be as large as possible while at the same time capable of being received within the peripheral portion 56. Thus the external diameter of the tab portion 58 is slightly smaller than the internal diameter of the peripheral portion 56 thereby defining a near annular space 62 between the two in plan view. The internal diameter of the tab portion 58 is selected so as to allow the insertion of a finger of a user.

[0017] In order to further facilitate this process, the pull-tab is moulded so that in its natural or relaxed state the tab portion 58 and tongue 60 occupy a plane that subtends an acute angle to that occupied by the peripheral portion 56. As a result, at a position opposite the tongue 60, the tab portion 58 is raised in height with respect to the peripheral portion 56 by a distance 64 and this enables the tab portion 58 to be grasped more easily and reliably by a user. Nevertheless, the tab portion 58 is joined to the peripheral portion 56 in a manner which is sufficiently flexible so that, when constrained, the tab portion 58 can occupy substantially the same plane as the peripheral portion 56 and sufficiently resilient to en-

able the tab portion 58 to return to its natural or relaxed state once that constraint has been removed.

[0018] In contrast to the tab portion 58, the peripheral portion 56 is provided with a plurality of lines of weakness which extend in a direction generally transverse to the tongue 60. In the embodiment shown, the lines of weakness take the form of a series of mutually spaced parallel grooves 66-72 which serve to divide the peripheral portion 56 into a number of sectors 74-82. In this regard it will be noted that grooves 66a and 66b are collinear and so in what follows will be referred to simply as groove 66. The same is also true of grooves 68a and 68b which will henceforth be referred to simply as groove 68 and is also true of grooves 70a and 70b which will henceforth be referred to as groove 70. Grooves 72a and 72b will henceforth be referred to simply as groove 72.

[0019] As can be seen from Figure 4, each of the grooves 66-72 is of V-shaped cross-section and is defined, in the case of groove 66, by mutually inclined surfaces 84 and 86.

[0020] In addition the pull-tab 54 is provided with a plurality of circumferentially spaced flanges 88 which project radially outwardly from the peripheral portion 56.

[0021] A cap 36 is also provided and comprises a circular top 90 which merges at a radially outer edge with a depending annular skirt 92. The annular skirt 92 is sized so as to fit over the neck 30 and, as stated previously, is provided on its inner surface with complimentary engagement means (not shown) for repeated and releasable engagement with the engagement means 34 provided on the container 32.

[0022] In order to assemble the components shown in Figure 4, the pull-tab 54 and metallic foil 42 are first received within the annular skirt 92 of the cap 36 with the pull-tab closest to the underside of the top 90. The purpose of the radially outwardly projecting flanges 88 provided on the peripheral portion 56 is to engage the inner surface of the annular skirt 92 above the complimentary engagement means and so retain the pull-tab 54 within the cap 36. Similar elements may also be provided on the metallic foil 42 to ensure that it too is retained within the cap 36. Alternatively, the metallic foil 42 may simply be formed oversize with an external diameter that is sufficient to retain the metallic foil within the annular skirt 92 above the complimentary engagement means.

[0023] Once the container 32 has been filled with the desired contents, the cap 36, together with the metallic foil 42 and the pull-tab 54, is offered up to the neck 30. Depending on the nature of the respective engagement means provided on the container and cap, the cap 36 is then pushed, rotated or otherwise applied to the neck 30 until such time as the metallic foil 42 is pressed against the rim 38 of the opening 40 and the peripheral portion 56 of the pull-tab 54 is pressed against the metallic foil 42. In this condition the assembled cap and neck are exposed to a time varying magnetic field which

gives rise to eddy currents within the electrically conductive substrate 44 and the generation of heat. This heat in turn melts the respective polyethylene layers 50 and 52 and bonds the metallic foil both to the rim 38 of the container 32 and also to the peripheral portion 56 of the pull-tab 54. In so doing the bonding components, comprising the respective layers of adhesive 46 and 48 and the respective layers of polyethylene material 50 and 52, are selected so as to ensure that a permanent bond is established between the metallic foil 42 and the peripheral portion 56 of the pull-tab 54 while a weaker, peelable bond is established between the metallic foil and the container 32. At the same time and in contrast to the peripheral portion 56, the tab portion 58 is not bonded to the metallic foil 42, either because it is not held in intimate contact with the metallic foil by virtue of its tendency to occupy a different plane from that of the peripheral portion or else, in an alternative embodiment, because the metallic foil 42 is provided on its upper surface with a non-stick form layer which underlies the tab portion 58 but not the peripheral portion 56.

[0024] In use the metallic foil 42 serves to maintain the freshness of the product packaged within the container and serves to provide the consumer with an indication that the container has not been subject to unauthorised tampering. Nevertheless, in order to dispense the contents of the container, the metallic foil must first be removed and discarded. This is achieved by unscrewing or otherwise disengaging the cap 36 from the container 32 so as to expose the pull-tab 54. The user then inserts a finger through the central aperture of the tab portion 58. In so doing the user is helped by the resilience of the pull-tab 54 which, once the cap 36 has been removed, is sufficient to cause the tab portion 58 to return to its natural or relaxed state in which it projects upwardly from the peripheral portion 56 and away from the metallic foil 42. The user then pulls on the pull-tab and, irrespective of the direction in which that pulling force is applied, the pulling force is nonetheless transmitted by the tongue 60 to the peripheral portion 56. However, rather than the pulling force being dissipated around the circumference of the peripheral portion 56 in an attempt to simultaneously overcome the bond between the metallic foil 42 and the container 32 at all points around the rim 38, because of the grooves 66-72, the pulling force applied by the user and transmitted by the tongue 60 is applied substantially only in the first sector 74 bounded by groove 66. As a result, in order to begin to peel the metallic foil 42 away from the rim 38 it is necessary only for the pulling force applied by the user to be sufficient to overcome the bond between the metallic foil 42 and the container 32 over the much smaller surface area of the first sector 74. Only once the metallic foil underlying this sector has been pulled away does the peripheral portion 56 hinge about groove 66, bringing mutually inclined surfaces 84 and 86 into abutting relationship so that the pulling force applied by the user is then transmitted to the second sector 76 bounded by

grooves 66 and 68. Again, because the pulling force applied by the user is restricted to overcoming the bond between the metallic foil 42 and the container 32 only in the region defined by the second sector, the pulling force need not be nearly so great as if it were attempting to overcome the strength of the same bond at all points around the rim. Thus, as the process repeats, a very much reduced pulling force is sufficient to overcome the bond between the metallic foil 42 and the container 32 in each of a succession of sectors before that pulling force is transmitted to the next adjacent sector. As a result the metallic foil 42 may be easily and reliably peeled away from the rim 38 and subsequently discarded together with the pull-tab 54.

[0025] With the removal of the metallic foil 42, the opening 40 is exposed and the contents of the container may be dispensed as desired. Should it be necessary to re-close the container 32, the cap 36 may simply be presented to the neck 30 and applied as necessary depending upon the nature of the engagement means 34. The cap 36 may be disengaged and reapplied to the container 32 as many times as necessary.

[0026] Although the peripheral portion 56 of the pull-tab 54 has been described as annular it will be apparent that the peripheral portion could have any shape although it is preferable that the shape correspond, at least approximately, to that of the periphery of the underlying opening 40. Nevertheless, the peripheral portion 56 of the pull-tab 54 may have a shape selected from the list comprising circular, elliptical, oval, triangular, square, rectangular, pentagonal and hexagonal.

[0027] Likewise, although the peripheral portion 56 has been described as having a shape corresponding to the periphery of the opening in its entirety (in other words that the peripheral portion has a shape which, like the rim 38, is closed), it will also be apparent that the peripheral portion may have a shape corresponding to only a part of the periphery of the opening. For example, where the opening is circular and is surrounded by an annular rim as in the example shown in Figure 4, the peripheral portion 56 of the pull-tab 54 may simply comprise a part annular shape as shown, for example, in Figure 7. Such an arrangement would still permit the metallic foil 42 to be pulled away from the underlying rim 38 using a significantly reduced pulling force.

[0028] It will also be appreciated that the external dimensions of the peripheral portion 56 may, if so desired, be other than substantially the same as that of the rim 38. In particular, the external dimensions may be greater than that of the rim thereby leading to the possibility of the peripheral portion being joined to the metallic foil at a position outwardly of the periphery of the opening. Conversely, the external dimensions of the peripheral portion may be less than that of the rim leading to the peripheral portion no longer overlying the rim but instead being joined to the metallic foil at a position inwardly of the periphery of the opening. Similarly, the internal dimensions of the peripheral portion 56 may, if so desired,

be substantially less than the opening 40 although this may have implications for the size and the shape of the tab portion 58.

[0029] Likewise, although the tab portion 58 has been described as a pull-ring, it need not necessarily be of annular shape provided that it may be readily gripped by a user. Thus, the tab portion 58 may comprise a tab of any shape, either with or without a central aperture, and may, for example, comprise a T-shape to facilitate easy gripping by a user. Likewise, although the tab portion 58 has been described as being of a size so as to be capable of being received within the peripheral portion 56 so that both the tab portion and the peripheral portion can, when so constrained, occupy substantially the same plane, this need not necessarily be the case. In particular, the tab portion may, if so desired, overlap the peripheral portion. This will, however, have an adverse affect on the overall height of the pull-tab 54 although, depending upon the nature of the cap 36 and the design constraints imposed upon the closure as a whole, this may be an acceptable trade off for a tab of increased surface area.

[0030] It will also be appreciated that although the tab portion 58 has been described as moulded so that in its natural or relaxed state it occupies a plane that subtends an angle to that occupied by the peripheral portion 56, once again this need not necessarily be the case. As shown in Figure 8, the tab portion 58 may alternatively be moulded so as to occupy a plane substantially parallel to that of the peripheral portion 56. Whilst the plane of the tab portion 58 may be coplanar with that of the peripheral portion 56, the tab portion is nevertheless preferably raised with respect to the peripheral portion so as to facilitate the tab portion being grasped more easily and reliably by a user. Of course, the tab portion 58 may be moulded so as to occupy a plurality of planes, one or more of which may be inclined to that occupied by the peripheral portion while others may be parallel to the peripheral portion.

[0031] Although the lines of weakness have been described as grooves, again it will be apparent that this need not be the case. In particular, the lines of weakness may instead comprise webs of material of reduced thickness or a series of apertures, either blind or representing through-holes, always provided, of course, that the lines of weakness are not so weak as to become frangible when a typical pulling force is applied to the pull-tab by a user. Where the lines of weakness are present in the form of grooves, it will be apparent that the grooves may be of any convenient shape and may, for example, be U-shaped or straight sided as shown in Figures 9 and 10.

[0032] Once again, although the lines of weakness have been described as extending parallel to each other, this need not necessarily be the case as the lines of weakness may, in the case of an annular or part annular peripheral portion overlying an annular rim, extend in a generally radial direction. However, it is preferable that

the lines of weakness extend in a direction transverse to the direction in which the pulling force applied to the tab portion is transmitted to the peripheral portion. Most preferably of all the lines of weakness extend in a direction substantially perpendicular to the direction in which a pulling force applied to the tab portion is transmitted to the peripheral portion.

[0033] In the embodiment described with reference to Figures 4 and 5 a plurality of lines of weakness are shown which are equally spaced apart such that the perpendicular distance between groove 66 and groove 68 is substantially the same as that between groove 68 and groove 70 and between groove 70 and groove 72. However, this need not necessarily be the case. In another arrangement the lines of weakness may be arranged so that each of the sectors defined by the lines of weakness are of equal surface area or overlie a bond between the metallic foil and the container which is of equal length. In this way the strength of the bond to be overcome between the metallic foil 42 and the container 32 will be substantially the same for each sector. It will, however, mean that the lines of weakness will be spaced closer together at a side of the peripheral portion close to the tongue 60 and will be spaced further apart in a region spaced 90° from the tongue. In any event, the tongue 60 is preferably joined to the peripheral portion 56 centrally of the first sector.

[0034] Although the pull-tab 54 has been described as comprising a plurality of lines of weakness, it would nevertheless be advantageous if the peripheral portion 56 comprised only a single line of weakness since this would still serve to divide the peripheral portion into two sectors. As a result the pull force that would need to be applied in order to remove the metallic foil would only need to overcome the bond associated with each sector in turn and not both sectors simultaneously. Nevertheless, the peripheral portion preferably comprises a plurality of lines of weakness so that once the metallic foil approximate the first sector has been pulled away, the pulling force applied to the tab portion is directed to a further sector of the peripheral portion having components on either side of the first sector. Similarly, once the metallic foil adhered to the second sector has been released from its engagement with the underlying portion of the rim, the pulling force applied to the tab portion is directed to a third sector which again comprises two components, each adjacent a respective one of the two components of the second sector.

[0035] As previously described, the metallic foil 42 is preferably adhered to both the rim 38 and the peripheral portion 56 by exposure to a time varying magnetic field. However, the partial melting or softening of the two layers of polyethylene material 50 and 52 represents a heat activated bond that may be achieved in other ways. For example, the two layers of polyethylene material 50 and 52 and the two layers of adhesive 46 and 48 used to adhere the layers of polyethylene material to the electrically conductive substrate 44 may all be replaced by

5 layers of heat activated adhesives applied to either side of the electrically conductive substrate. What is important in this context is that a permanent bond is provided between the metallic foil 42 and the pull-tab 54 while a peelable or removable bond is provided between the metallic foil 42 and the container 32. In any event, the bonding of the metallic foil 42 to both the container 32 and the pull-tab 54 may be activated by alternate means. For example, the bond may be activated by exposing the cap and neck assembly to microwave radiation or to a time varying electric field.

10 [0036] Once again whilst the opening 40 has been described as closed by a metallic foil 42, the metallic foil 42 may, in principle, be replaced by any suitable membrane and may, for example, comprise a web of plastics material. Under such circumstances, the pull-tab 54 may be formed integrally with the membrane which may, in turn, be provided with a line of weakness extending around the periphery of the underlying opening 40. This line of weakness may either be in the plane of the membrane or else in the cylindrical surface of the neck 30.

15 [0037] Finally, although the assembly has been described as comprising a cap 36, this is entirely optional as the container may, under certain circumstances, be adequately sealed simply by use of the metallic foil or membrane 42. However, once the metallic foil or membrane has been removed, re-closure of the container would then not be possible.

### 30 Claims

35 1. A pull-tab for use in removing a membrane adhered to a container, the container defining an opening having a periphery and the membrane overlying the opening and being adhered to said periphery so as to prevent access to the contents of the container via said opening prior to the removal of the membrane, the pull-tab comprising

40 a peripheral portion having a shape corresponding to at least a part of the periphery of said opening and being joined to the membrane in a region approximate said part and a tab portion joined to the peripheral portion, the peripheral portion comprising means to restrict a pulling force applied to the tab portion from being substantially transmitted to all but a sector of the peripheral portion until such time as the membrane approximate said sector has been pulled away from the container.

45 2. A pull-tab in accordance with claim 1 wherein the peripheral portion has a shape selected from the list comprising circular, elliptical, oval, triangular, square, rectangular, pentagonal, hexagonal, arcuate, part-circular, part-elliptical, part-oval, part-triangular, part-square, part-rectangular, part-pentagonal and part-hexagonal.

3. A closure assembly in combination with a container, the container defining an opening having a periphery and the closure assembly comprising a membrane and a pull-tab, the membrane overlying the opening and being adhered to said periphery so as to prevent access to the contents of the container via said opening prior to the removal of the membrane, and the pull-tab comprising a peripheral portion having a shape corresponding to at least a part of the periphery of said opening and being joined to the membrane in a region approximate said part and a tab portion joined to the peripheral portion, the peripheral portion comprising means to restrict a pulling force applied to the tab portion from being substantially transmitted to all but a sector of the peripheral portion until such time as the membrane approximate to said sector has been pulled away from the container.
4. The combination of claim 3 wherein the container defines an opening having a periphery having a shape selected from the list comprising circular, elliptical, oval, triangular, square, rectangular, pentagonal and hexagonal.
5. The invention of any preceding claim wherein the peripheral portion has a shape corresponding to substantially the entire periphery of said opening.
6. The invention of any preceding claim wherein the peripheral portion is adapted so as to at least partially overlie the periphery of the opening.
7. The invention of any of claims 1 to 5 wherein the peripheral portion is adapted so as to be joined to the membrane at a position outwardly of the periphery of the opening.
8. The invention of any of claims 1 to 5 wherein the peripheral portion is adapted so as to be joined to the membrane at a position inwardly of the periphery of the opening.
9. The invention of any preceding claim wherein the tab portion comprises a pull-ring.
10. The invention of any preceding claim wherein the tab portion is sized so as not to overlap the peripheral portion in plan view.
11. The invention of any preceding claim wherein the tab portion is formed integrally with the peripheral portion of plastics material.
12. The invention of any preceding claim wherein, in a natural state, the tab portion occupies a different plane from that occupied by the peripheral portion, said planes being mutually spaced at at least one point on the tab portion.
13. The invention of any preceding claim wherein, in a natural state, the tab portion occupies a plane that subtends an acute angle with a plane occupied by the peripheral portion.
14. The invention of any preceding claim wherein the tab portion is joined to the peripheral portion in a manner which is sufficiently flexible so that, when constrained, the tab portion can occupy substantially the same plane as the peripheral portion and sufficiently resilient to enable the tab portion to return to a natural state once said constraint has been removed in which the tab portion occupies a plane different from that occupied by the peripheral portion.
15. The invention of any preceding claim wherein the means to restrict the pulling force applied to the tab portion from being substantially transmitted to all but a sector of the peripheral portion until such time as the membrane approximate said sector has been pulled away from the container comprises one or more lines of weakness that serve to divide the peripheral portion into a plurality of sectors.
16. The invention of claim 15 wherein said lines of weakness comprise one or more grooves.
17. The invention of claim 16 wherein the grooves have a cross-sectional shape selected from the list comprising V-shaped, U-shaped or straight-sided-channel-shaped.
18. The invention of any of claims 15 to 17 wherein the or each line of weakness extends in a direction transverse to the direction in which a pulling force applied to the tab portion is transmitted to the peripheral portion.
19. The invention of any of claims 15 to 18 wherein the or each line of weakness extends in a direction substantially perpendicular to the direction in which a pulling force applied to the tab portion is transmitted to the peripheral portion.
20. The invention of any of claims 15 to 19 and comprising two or more lines of weakness, each line of weakness extending substantially parallel to the other or others.
21. The invention of any of claims 15 to 20 and comprising two or more lines of weakness wherein each line of weakness is equally spaced apart.
22. The invention of any of claims 15 to 20 and comprising two or more lines of weakness wherein the lines of weakness are spaced so that each of the

- sectors defined thereby are of substantially equal peripheral extent.
23. The invention of any of claims 15 to 22 and comprising two or more lines of weakness wherein the lines of weakness are arranged symmetrically about the direction in which a pulling force applied to the tab portion is transmitted to the peripheral portion. 5
24. The invention of any of claims 15 to 23 wherein the tab portion is joined to the peripheral portion centrally of one of said sectors. 10
25. The invention of any of claims 15 to 24 wherein once said membrane approximate a first sector has been pulled away from the container, the pull-tab is adapted to direct the pulling force applied to the tab portion to a second sector of the peripheral portion, the second sector having components adjacent opposite sides of said first sector. 15  
20
26. The invention of any of claims 15 to 25 wherein once said membrane approximate a first sector has been pulled away from the container, the pull-tab is adapted to direct the pulling force applied to the tab portion to each of the remaining sectors in succession whilst ensuring that the pulling force is not transmitted to a sector until such time as the membrane approximate all of the preceding sectors has been pulled away from the container. 25  
30
27. The invention of any preceding claim wherein the peripheral portion is joined to the membrane by a permanent bond and the membrane is adhered to said periphery by a weaker, peelable bond. 35
28. The invention of any preceding claim wherein the membrane comprises an electrically conductive material and is adhered to the periphery of the opening by a heat activated bond. 40
29. The invention of claim 28 wherein the heat activated bond is activated by exposing the membrane to one of a list comprising microwave radiation, a time varying magnetic field and a time varying electric field. 45
30. The invention of any preceding claim wherein the membrane comprises a metallic foil. 50
31. The invention of any of claims 1 to 26 wherein the membrane is formed of plastics material and is formed integrally with the peripheral portion.
32. The invention of claim 31 wherein a line of weakness is provided extending around the periphery of the opening. 55

FIG. 1.

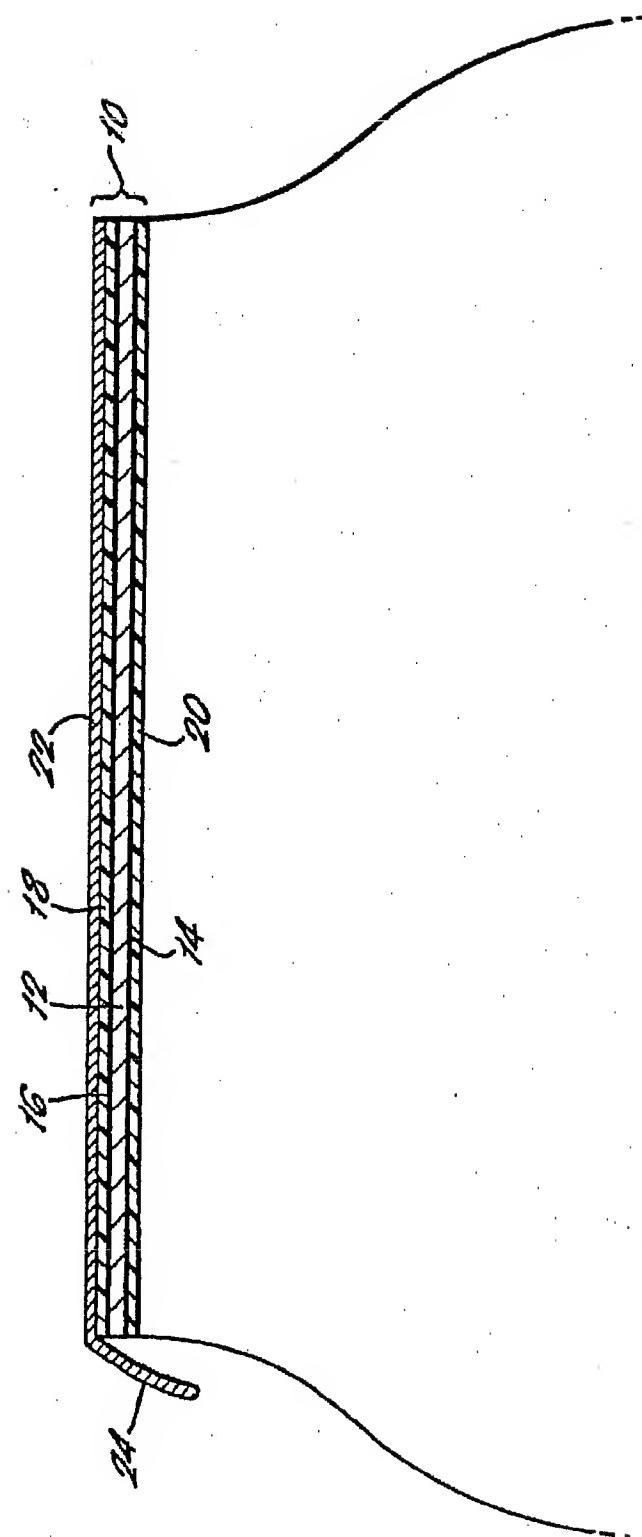


FIG. 2.

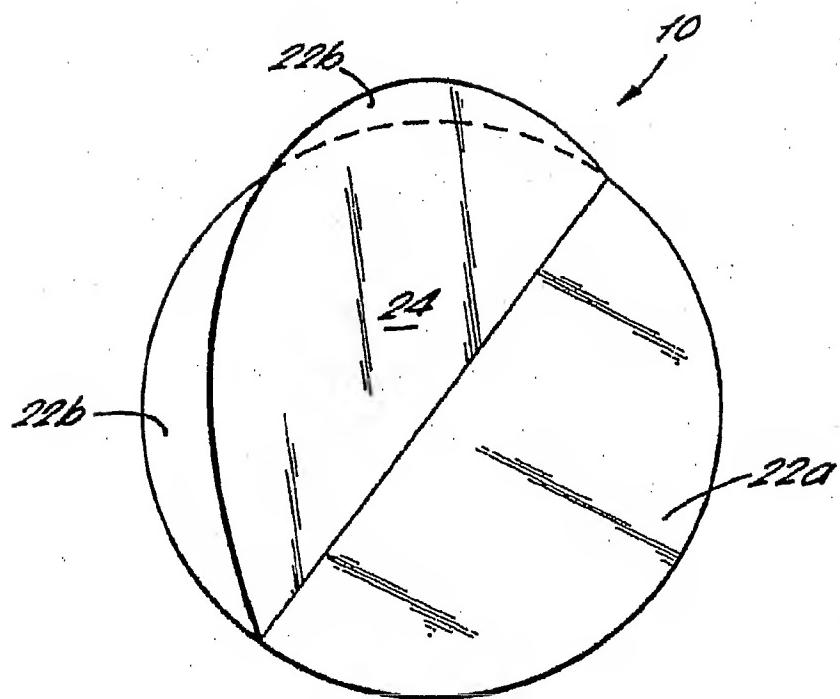


FIG. 3.

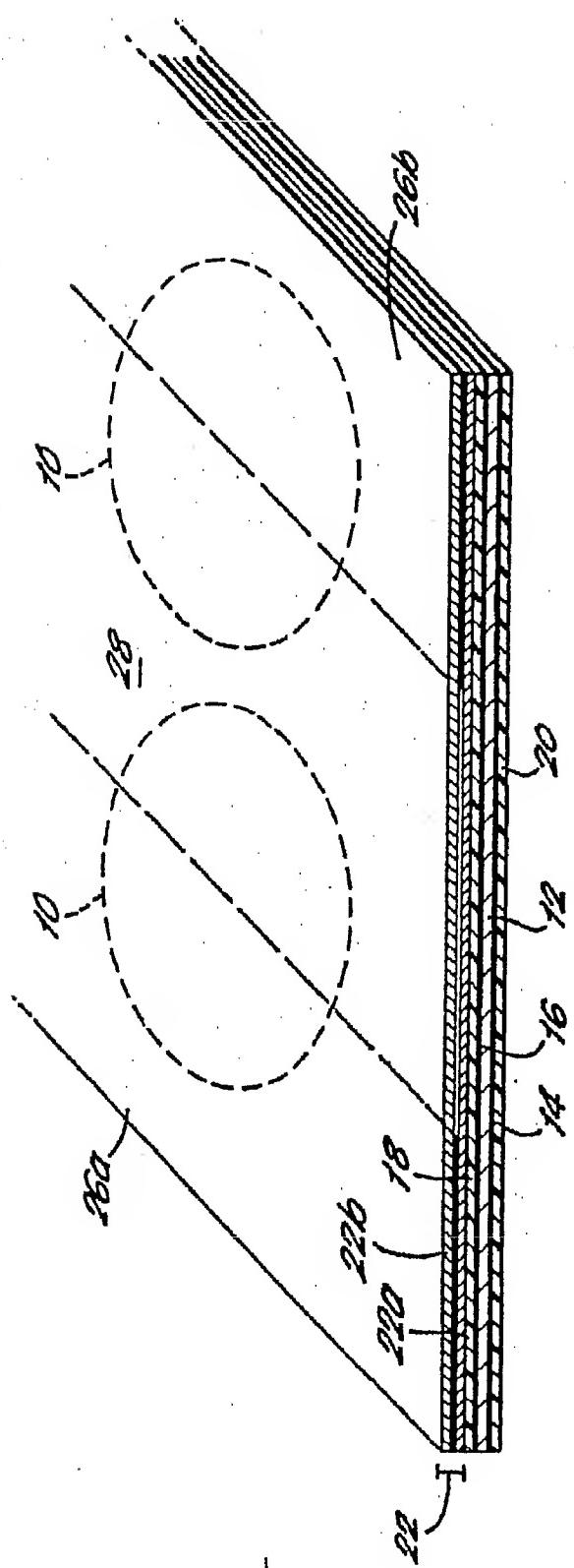


FIG.4.

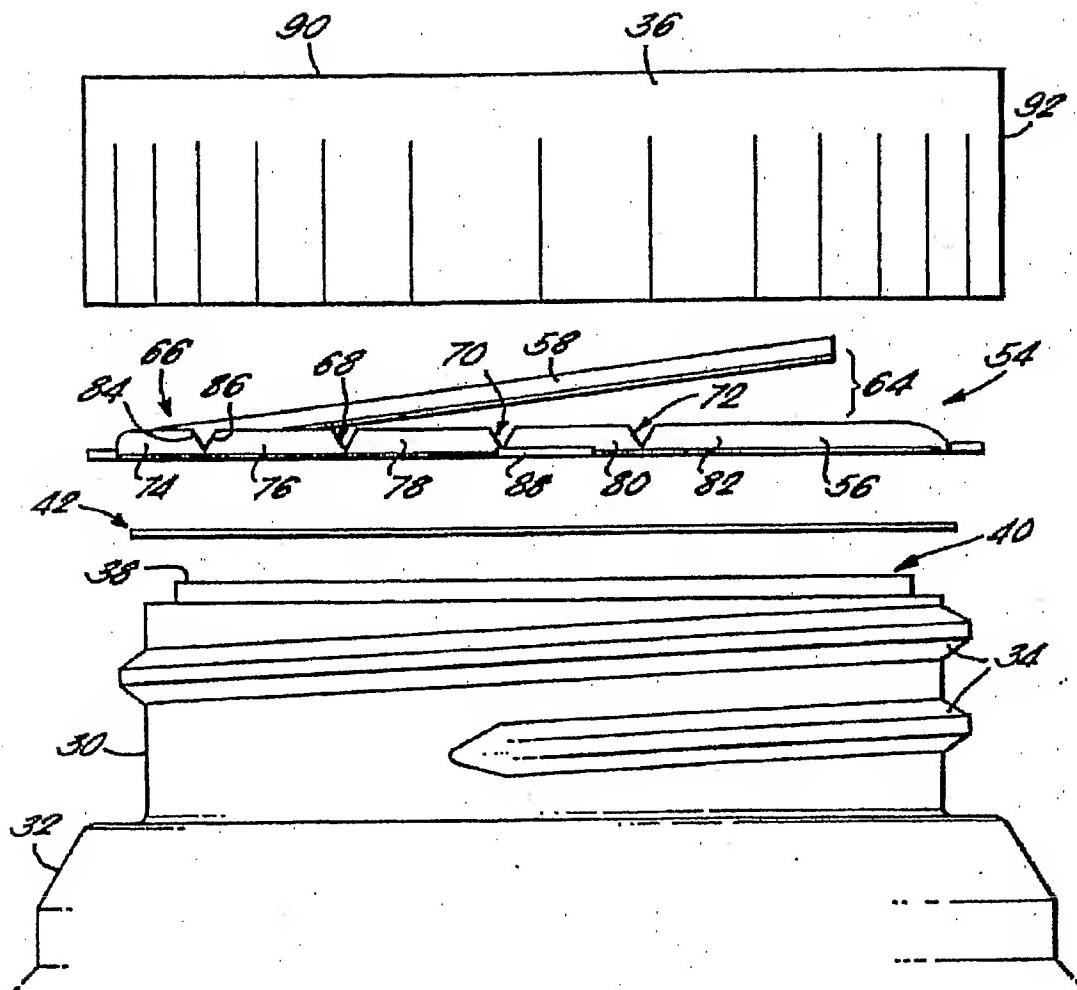


FIG.5.

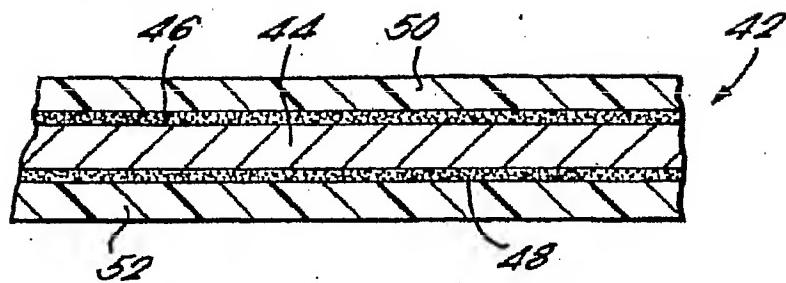


FIG.6.

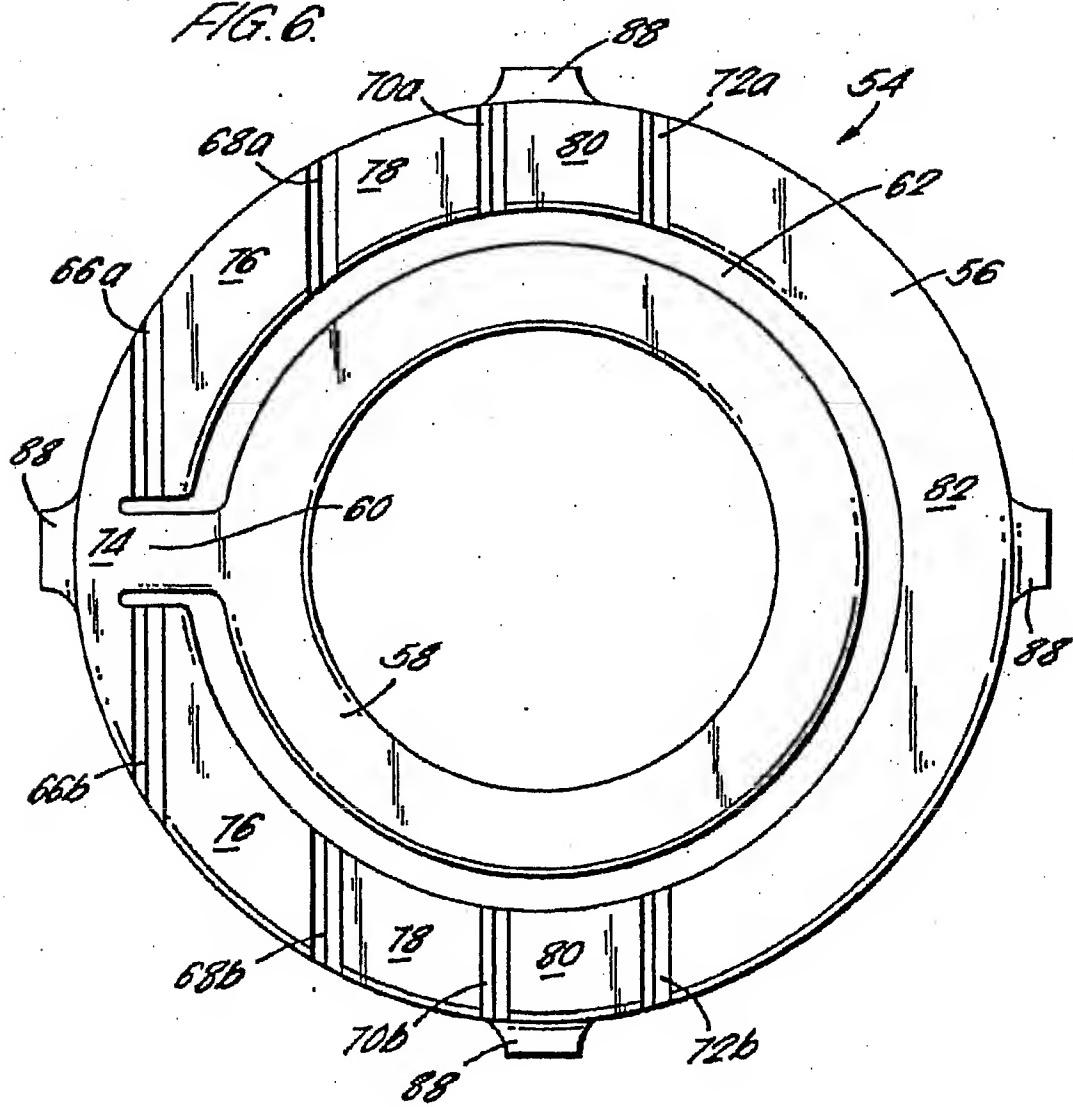


FIG. 7.

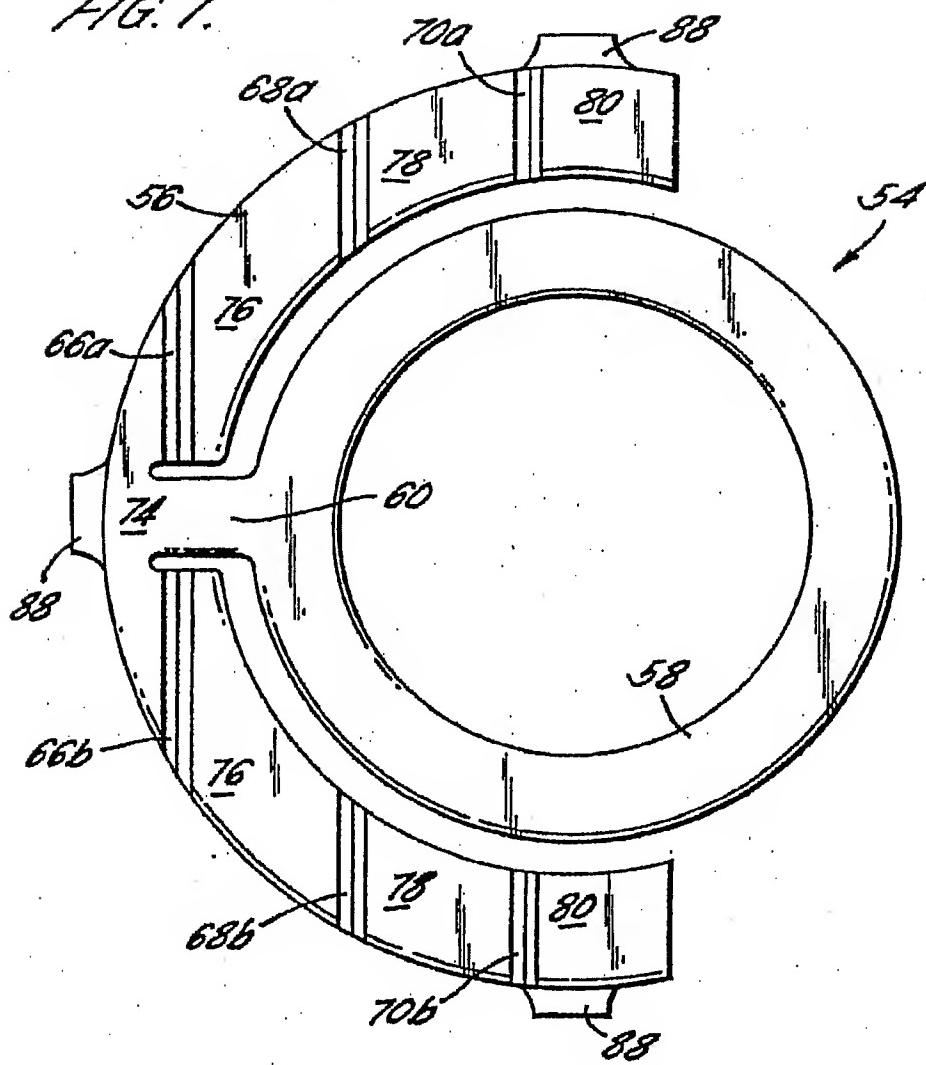


FIG. 9.

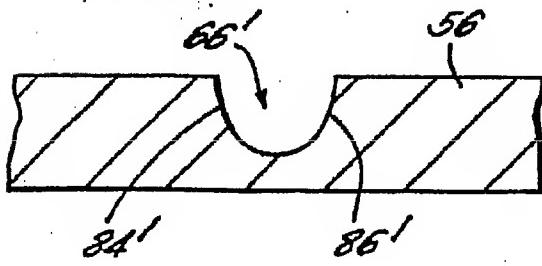
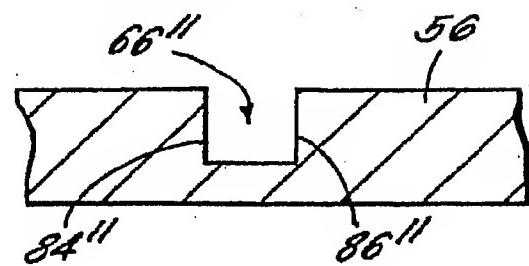
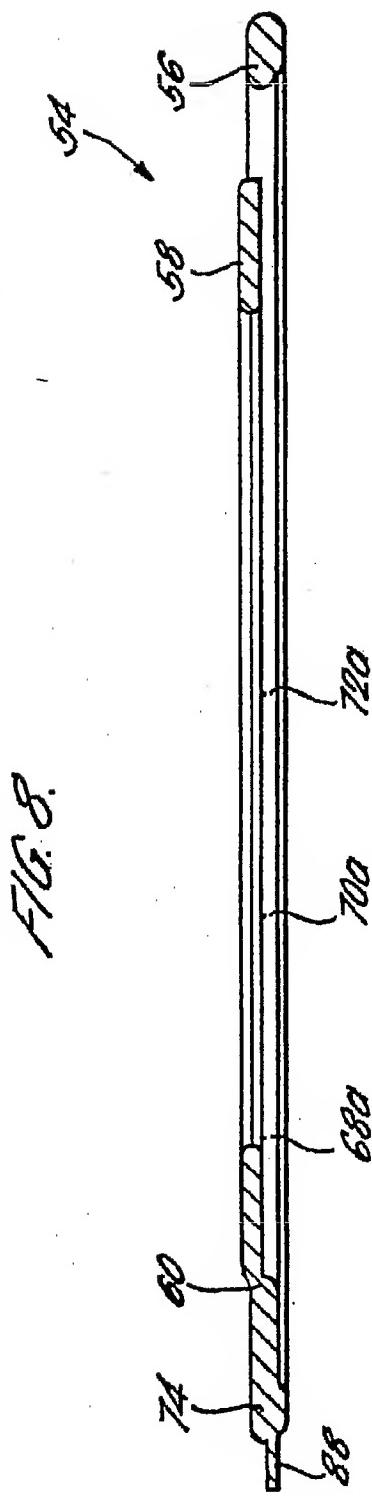


FIG. 10.







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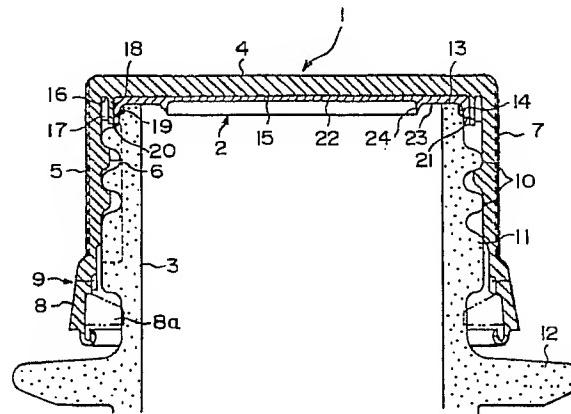
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(54) Plastic container closure and method of producing the same

(57) A plastic container closure comprising a top panel (4), a skirt portion (5), an annular protruded portion (18) that is formed inwardly from the inner surface of the top panel and on the inside of a portion near the root of the skirt maintaining a small gap (17) therebetween, and a sealing liner (2) that is fitted by press-molding on the inside of the top panel, wherein a substantially vertical portion (21) is formed on said liner along the inner surface of the annular protruded portion, and sealing performance is maintained by the engagement between the outer edge of the mouth of the container and the substantially vertical portion. Since the sealing is accomplished over a surface having a predetermined width in the up-and-down direction, the sealing performance is not impaired even when the top panel is deformed by the pressure. Moreover, favorable sealing performance is maintained even against shock that is given to the container at the time of fitting the closure.

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BACKGROUND OF THE INVENTION

## (Field of the Invention)

The present invention relates to a plastic container closure and to a method of producing the same. More specifically, the invention relates to a plastic container closure with liner featuring high sealing precision, excellent sealing performance to the mouth of the container and, particularly, excellent shock-resistant sealing performance and pressure-resistant sealing performance, and to a method of producing the same.

## (Description of the Prior Art)

In recent years, metal container closures have been replaced by plastic container closures for hermetically sealing the mouths of plastic bottles and glass bottles owing to their merits of easy disposal and recycled use.

Some plastic container closures use, as the sealing material, the synthetic resin itself that is forming the inner surface of the top panel of the container closure. From the standpoint of obtaining hermetically sealing performance and, particularly, pressure-resistant sealing performance, however, it is desired to employ a liner or a packing that is excellent in softness and cushioning property.

Japanese Patent Publications Nos. 44627/1988, 48704/1988 and 8141/1994 are disclosing container closures provided with a liner, wherein provision is made of an inwardly extending annular liner-holding member on the inner surface of a skirt portion which is integrally continuous to the outer peripheral edge of the top panel, so that the liner will not escape from the closure shell.

Furthermore, Japanese Patent Publication No. 13349/1994 discloses a plastic container closure having a packing provided in the closure shell and further having a plurality of annular ribs formed on the top panel of the container closure.

According to the former method of providing an annular liner-holding member on the inner surface of the skirt portion, however, a portion of the annular holding member of the container closure shell must be forcibly released at the time of molding the container closure shell and, hence, the annular liner-holding member must have a reduced thickness. In press-molding the liner, therefore, the annular holding member is deformed in an undulated manner at the time of bringing the outer sleeve of the molding tool and the annular holding member into engagement together, whereby the liner leaks outwardly or it becomes difficult to strictly control the size of the sealing portion on the outer periphery of the liner.

The container closure used for the contents that produce pressure loses pressure-resistant sealing performance due to its buckling deformation at the top panel portion. It is therefore desired to accomplish the sealing along the outer peripheral portion of the mouth of the bottle rather than at the top of the mouth of the bottle. The above-mentioned former container closure, however, does not permit to establish even such a sealing structure.

On the other hand, the latter container closure is satisfactory from the standpoint of accomplishing the sealing along the outer peripheral portion of the mouth of the bottle, but requires cumbersome operation for fitting the packing piece by piece into a number of container closures. Besides, the packing that is fitted may often escape, which is not still satisfactory from the viewpoint of operability.

SUMMARY OF THE INVENTION

The object of the present invention, therefore, is to provide a plastic container closure with liner featuring high sealing precision, excellent sealing performance to the mouth of the container and, particularly, excellent shock-resistant sealing performance and pressure-resistant sealing performance, and a method of easily producing the same.

Another object of the present invention is to provide a method of producing a plastic container closure, which method is capable of easily forming the closure shell as well as the liner and, besides, capable of forming the liner maintaining a high dimensional precision.

According to the present invention, there is provided a plastic container closure with liner comprising a top panel of the plastic container closure, a skirt portion which downwardly extends from the peripheral edge of said top panel and has a thread formed in the inside thereof to come into engagement with the mouth of the container, an annular protruded portion that is formed inwardly from the inner surface of said top panel and on the inside of a portion near the root of the skirt maintaining a small gap therebetween, and a sealing liner that is fitted by press-molding on the inside of said top panel, wherein a substantially vertical portion is formed on said liner along the inner surface of said annular protruded portion, and sealing performance is maintained by the engagement between the outer edge of the mouth of the container and the substantially vertical portion of the liner.

According to the present invention, furthermore, there is provided a method of producing a plastic container closure with liner, comprising:

feeding a resin for molding the liner into the inner surface of a top panel of a plastic container

closure which has the top panel, a skirt portion which is threaded in the inside thereof for engagement with the mouth of a container, and an annular protruded portion that stands nearly upright from the inner surface of the top panel maintaining a small gap from the skirt portion;

arranging a core having a tip for molding the central portion of the liner, an intermediate bush having a tip for molding a sealing portion of the liner, and an outer sleeve having a tip for engagement with said annular protruded portion of the container closure, in concentric with one another;

advancing said tips toward the top panel of the container closure, so that said tip for engagement is brought into engagement with the annular protruded portion of the container closure and that said tip for molding the sealing portion of the liner is brought into engagement with the top panel of the container closure;

pressing in this state the resin for molding the liner using the core, so that the intermediate bush is retreated by the resin pressure; and

flowing the resin into space defined by said tip for molding the sealing portion of the liner, said tip for engagement, peripheral portion on the inner surface of the top panel, and inner side surface of said annular protruded portion, thereby to mold the central portion of the liner having a reduced thickness, to mold the peripheral portion of the liner having a thickness larger than that of the central portion, and to mold a substantially vertical portion of the liner on the inner side surface of said annular protruded portion.

In the present invention, it is most desired that the inner peripheral surface of the annular protruded portion is provided substantially vertically to the top panel, the inner peripheral surface of the annular protruded portion has a diameter larger than that of the mouth of the container that is to be sealed but is smaller than the diameter of the threaded portion that engages with the mouth of the container. It is further desired that the annular protruded portion has a shape that becomes narrow toward the tip thereof and has an outer peripheral surface that is tilted inwardly and, particularly, that the annular protruded portion has a flexible tip of which the inner peripheral surface is slightly tilted inwardly toward the end thereof or has a tip that is inwardly protruding. Moreover, the annular protruded portion may have the inner peripheral surface that is substantially vertical or may have the inner peripheral surface that is tilted slightly inwardly.

According to the present invention, it is desired to arrange a plurality of ribs along the circumference between the annular protruded portion and a portion near the root of the skirt to bridge them together, and it is particularly desired that the plu-

rality of ribs are arranged at an angle that is tilted relative to the radial direction.

The plastic container closure of the present invention comprises a plastic closure shell and a liner provided on the side of the inner surface of the shell. Besides, the closure shell comprises the top panel and the skirt portion which is threaded in the inner peripheral surface thereof for engagement with the container. Distinguished features reside in that the annular protruded portion is provided inwardly from the inner surface of the top panel and on the inside of a portion near the root of the skirt maintaining a small gap therebetween and that the substantially vertical portion (falling portion) of the liner is formed along the inner side surface of the annular protruded portion.

That is, with the annular protruded portion being provided on the inner surface of the top panel, the liner member that outwardly tends to spread in the radial direction due to the press-molding is blocked by the protruded portion to form a substantially vertical portion (rising portion in the case of the press-molding), and sealing is accomplished over a cylindrical surface having a predetermined width in the up-and-down direction between the outer peripheral portion of the mouth of the container and the substantially vertical portion of the liner. Accordingly, the plastic container closure with liner of the present invention maintains pressure-resistant sealing even when the top panel is deformed by the pressure. Besides, the force that acts between the annular protruded portion and the substantially vertical portion of the liner at the time of closing or opening the container, is chiefly a shearing force in the up-and-down direction or in the circumferential direction, which is not a peeling force. Therefore, the sealing performance is not impaired between the annular protruded portion and the substantially vertical portion of the liner.

Moreover, since a small gap is provided between the annular protruded portion and the portion near the root of the skirt, the annular protruded portion tolerates elastic deformation that outwardly expands in the radial direction. Therefore, despite there exists some dimensional error in the outer periphery of the mouth of the container, reliable sealing is accomplished when the container is closed, and markedly improved shock-resistant sealing performance is exhibited being compounded by the sealing over the surface that has a width in the up-and-down direction.

Furthermore, with the annular protruded portion being provided on the inner surface of the top panel, this portion needs not be forcibly released from the metal mold at the time of molding the container closure shell. Accordingly, the molding operation is easy, and no particular limitation is imposed on the shape and size of the annular

protruded portion.

According to the production method of the present invention, the liner is formed in a predetermined shape by feeding a resin for molding the liner into the inner surface of the top panel of the plastic container closure and by press-molding the resin, and further arranging a core having a tip for molding the central portion of the liner, arranging an intermediate bush having a tip for molding a sealing portion of the liner, and arranging an outer sleeve having a tip for engagement with said annular protruded portion of the container closure, all in concentric with one another, advancing said tips toward the top panel of the container closure, so that said tip for engagement is brought into engagement with the annular protruded portion of the container closure and that said tip for molding the sealing portion of the liner is brought into engagement with the top panel of the container closure, pressing in this state the resin for molding the liner using the core, so that the intermediate bush is retreated by the resin pressure, and flowing the resin into space defined by said tip for molding the sealing portion of the liner, said tip for engagement, a peripheral portion on the inner surface of the top panel, and an inner side surface of said annular protruded portion, thereby to mold the central portion of the liner having a reduced thickness, to mold the peripheral portion of the liner having a thickness larger than that of the central portion, and to mold a substantially vertical portion of the liner on the inner side surface of said annular protruded portion.

According to this method, the thick peripheral portion of the liner and the substantially vertical portion of the liner are molded by the resin pressure in a state where the tip of the outer sleeve of the molding tool and the annular protruded portion are reliably engaged with each other. Besides, the liner material does not leak to the outer side beyond the annular protruded portion, and the liner is molded having favorable shape and dimensional precision.

According to the present invention, the inner peripheral surface of the annular protruded portion is molded to be substantially vertical with respect to the top panel, and the inner peripheral surface of the annular protruded portion has a diameter which is larger than the diameter of the outer periphery of the mouth of the container that is to be closed but is smaller than the diameter of the inner periphery of the threaded portion that engages with the mouth of the container, so that the container can be easily closed or opened, and that the container closure shell can be easily molded and the liner can be easily press-molded, too.

By so molding the annular protruded portion that it becomes narrow toward the tip thereof and

that its inner peripheral surface is slightly tilted inwardly, it is made possible to easily draft the mold at the time of molding the container closure shell as well as to reliably hold the liner in the shell and to reliably bring the annular protruded portion and the outer sleeve used for the molding into engagement with each other maintaining sealing. To obtain the above-mentioned actions and effects, in particular, the annular protruded portion should have a flexible tip that becomes narrow toward the end thereof and the inner peripheral surface that is slightly tilted inwardly toward the end thereof or a flexible tip that protrudes inwardly. The inner peripheral surface of the annular protruded portion may be vertical or may be slightly tilted inwardly.

#### BRIEF DESCRIPTION OF THE DRAWINGS

- Fig. 1 is a side sectional view illustrating a container closure of the present invention together with the mouth of a container;
- Fig. 2 is a diagram of a step for illustrating the method of molding a sealing liner in a container closure shell, and explains a step (A) of feeding a resin for molding the sealing liner;
- Fig. 3 is a diagram of a step for illustrating the method of molding a sealing liner in a container closure shell, and explains a step (B) for lowering the tool for molding the liner;
- Fig. 4 is a diagram of a step for illustrating the method of molding the sealing liner in the container closure shell, and explains a step (C) where the preparation for molding is completed;
- Fig. 5 is a diagram of a step for illustrating the method of molding the sealing liner in the container closure shell, and explains a step (D) where the molding is finished;
- Fig. 6 is a side sectional view illustrating an embodiment of a rib structure;
- Fig. 7 is a bottom view of the embodiment of Fig. 6;
- Fig. 8 is a perspective view of the embodiment of Fig. 6;
- Fig. 9 is a sectional view illustrating, on an enlarged scale, an annular protruded portion of the container closure shell;
- Fig. 10 is a sectional view illustrating, on an enlarged scale, the protruded portion of the container closure shell according to another embodiment;
- Fig. 11 is a sectional view illustrating, on an enlarged scale, the annular protruded portion having a flexible tip in the container closure shell; and
- Fig. 12 is a sectional view illustrating, on an enlarged scale, the annular protruded portion having the flexible tip in the container closure shell according to a further embodiment.

## DETAILED DESCRIPTION OF THE INVENTION

### [Container Closure]

Referring to Fig. 1 which illustrates a container closure of the present invention together with the mouth of a container, the container closure comprises a container closure shell 1 and a liner 2 provided in the inner portion thereof, and is fitted onto the mouth 3 of the container. The closure shell 1 is formed by integrally molding a synthetic resin by the injection molding or the compression molding, and comprises a top panel 4 and a skirt portion 5 hanging down from the peripheral edge of the top panel. An internal thread 6 is formed in the inner surface of the skirt portion 5 for being fastened to the mouth 3 of the container, and knurled grooves 7 are formed in the outer surface thereof so that the container closure can be gripped. A fastening band 8 equipped with flap pieces 8a for engagement with the container is provided on the lower side of the skirt portion 5 via a pilfer-proof mechanism 9 such as perforation that will be cut at the time of opening the closure.

The mouth 3 of the container is formed of a glass or a plastic, and an external thread 10 is formed on the side surface thereof for fastening and opening. On the lower side of the external thread 10 are formed a jaw portion 11 for engagement and a support ring 12 for supporting the container in the steps of charging and transfer. The mouth 3 of the container has a top portion 13 for maintaining sealing relative to the liner 2 and an outer peripheral portion 14 for sealing formed on the outer peripheral side of the top portion.

In the container closure of the present invention, an annular protruded portion 18 is provided inwardly from the inner surface 15 of the top panel and on the inside of a portion 16 near the root of the skirt maintaining a small gap 17 therebetween. In the embodiment shown in Fig. 1, an inner side surface 19 of the annular protruded portion 18 is substantially perpendicular to the inner surface of the top panel and has a flexible tip 20 that becomes narrow toward the end thereof and having an inner peripheral surface that is tilted slightly inwardly toward the end thereof.

The sealing liner 2 formed by the press-molding is provided on the inside of the top ceiling of the container closure shell 1. Here, it is important that a falling portion 21 of the liner is formed along the inner side surface 19 of the annular protruded portion 18 of the shell 1 from the standpoint of forming a sealing structure relative to the outer peripheral portion 14 for sealing of the mouth of the container maintaining excellent pressure-resistant sealing performance and shock-resistant sealing performance. The diagrammed embodiment will now

be described in further detail. Though it may vary depending upon the molding method, the sealing liner 2 has a thin central portion 22 and a thick surrounding portion 23 along the circumference thereof. The aforementioned substantially vertical portion 21 is formed on the outer peripheral side of the thick peripheral portion 23. A tapered downward protrusion 24 is formed between the thin central portion 22 and the thick peripheral portion 23. The tapered downward protrusion 24 is formed for the purpose of easily forming the thick peripheral portion and the substantially vertical portion, and its method of formation will be described later in detail.

Referring to Figs. 2 to 5 for explaining the method of molding the sealing liner in the container closure shell, Fig. 2(A) illustrates a step for feeding a resin for molding the sealing liner, Fig. 3(B) illustrates a step for lowering the tool for molding the liner, Fig. 4 (C) illustrates a step where the preparation for molding is completed, and Fig. 5(D) illustrates a step where the molding is finished.

The container closure shell 1 that is used is basically the same as the one shown in Fig. 1. Fig. 2(A), however, shows the structure in detail of when the container closure is viewed from the inside. That is, the above-mentioned perforation comprises a cutting line 29 for completely cutting the skirt portion 5 and the fastening band 8 from each other, and inner ribs 25 for coupling the skirt portion 5 and the fastening band 8 together in the circumferential direction maintaining a gap. The internal thread 6 formed in the inner surface of the skirt portion 5 is cut in the axial direction maintaining a predetermined distance in the circumferential direction thereby to form gas vent passages 26 of when the closure is opened. At the lower edge (upper end in Fig. 2) of the fastening band 8 is formed an inwardly faced curled portion 27 for reinforcing the flap pieces 8a that engage with the container. It will be further obvious that the flap pieces 8a are provided being tilted at a predetermined angle with respect to the radial direction in order to prevent the turn of the fastening band 8 relative to the mouth of the container at the time of fitting the closure and to reliably prevent the inner ribs 25 in the perforation from being cut.

In Fig. 2(A), the container closure shell 1 is held on an anvil (not shown) of the liner-molding machine in a manner that the top panel is on the lower side, and a nozzle of the extruder is passed into the container closure shell 1 to supply molten pellets 28 of a resin composition for molding the sealing liner.

Referring to Fig. 3(B), the assembly devices for molding the sealing liner comprise a core 31 having a tip 30 for molding the central portion of the liner, an intermediate bush 33 having a tip 32 for

molding the sealing portion of the liner and a notch 36 formed in the inner peripheral side of the tip, and an outer sleeve 35 having a tip 34 for engagement with the annular protruded portion 18 of the container closure, which are all arranged in concentric with each other. The intermediate bush 33 is in a most downwardly protruded state, the outer sleeve 35 is in a slightly retreated state, and the core 31 is in a mostly retreated state. Though not diagrammed, these members are connected to a pressurizing means such as hydraulic cylinder or to a pressurizing mechanism such as cam or the like via a resilient member such as spring, so as to be moved up and down. The core 31, intermediate bush 33 and outer sleeve 35 descend toward the container closure shell 1 while maintaining the above-mentioned state, and the core 31 starts pushing the molten pellet 28.

The assembly devices 31, 33 and 35 for molding continue to descend until the tip for molding the sealing portion of the liner of the intermediate bush 33 comes into engagement with the inner surface of the top panel of the container closure shell 1 as shown in Fig. 4(C), whereby the container closure shell 1 is reliably held. At the same time, the tip 34 for engagement of the outer sleeve 35 comes into engagement with the annular protruded portion 18 of the container closure maintaining sealing performance, whereby preparation is completed for molding the thick outer peripheral portion and the substantially vertical portion of the liner. Even during this moment, the core 31 continues to descend to press the molten pellets 28.

In the last stage of pushing shown in Fig. 5(D), the resin 28 for molding the liner filled between the tip 30 for molding the central portion of the liner and the inner surface 15 of the top panel, is still pushed by the core 31, flows due to the resin pressure into space defined by the outer side surface of the core 31 and the notch 36 of the intermediate bush 33, and causes the intermediate bush 33 to be retreated overcoming its pressure. Accordingly, the resin flows into space defined by the tip 32 for molding the sealing portion of the liner of the intermediate bush, peripheral portion on the inner surface 15 of the top panel, and inner side surface 19 of the annular protruded portion 18, whereby the central portion of the liner is molded having a reduced thickness, the peripheral portion of the liner is molded having a thickness larger than that of the central portion, and a substantially vertical portion (which is a rising portion since the container closure is placed upside down in the drawings) of the liner is molded on the inner side surface 19 of the annular protruded portion.

According to the method of producing container closures of the present invention, the annular protruded portion 18 and the outer sleeve 35 can

be hermetically engaged with each other without causing the annular protruded portion 18 to be deformed since the annular protruded portion 18 is nearly vertically provided with respect to the top panel 4. As a result, it is allowed to mold the substantially vertical portion of the liner maintaining a very high dimensional precision without permitting the resin for molding the liner to be leaked. In molding the container closure shell 1, furthermore, since the annular protruded portion 18 that is molded is released from the metal mold without requiring any particular force, advantages are brought about with regard to easy molding maintaining any desired size without permitting any variation in the sizes of the annular protruded portion 18.

In the container closure of the present invention as shown in Fig. 1, furthermore, the sealing is accomplished owing to the intimate adhesion on an area having a predetermined width in the axial direction of the container between the substantially vertical portion 21 of the liner and the outer peripheral portion 14 for sealing of the mouth of the container. Therefore, even when deviation takes place between the container and the container closure relative to each other in the axial direction due to pressure or shock, excellent sealing performance is maintained. Moreover, the annular protruded portion 18 is independently provided maintaining a small gap from the skirt portion 5 of the closure shell. Therefore, even in case shock is exerted on the closure shell 1, the sealing portion is not affected or are affected very little. Besides, external force exerted on the mouth of the container in the radial direction is reduced due to elastic deformation of the annular protruded portion 18.

In the present invention, it is an indispensable requirement that a small gap is formed between the annular protruded portion 18 and the skirt portion 5 of the closure shell. As required, furthermore, a rib structure may be formed between the two.

Referring to Fig. 6 (side sectional view), Fig. 7 (bottom view) and Fig. 8 (perspective view) illustrating an embodiment of the rib structure, a plurality of ribs 38 are disposed between the annular protruded portion 18 and the portion 16 near the root of the skirt to bridge them together along the circumferential direction maintaining a gap. The ribs 38 permit the annular protruded portion 18 to be deformed to some extent, but prevent them from being excessively deformed and further work to mechanically reinforce the annular protruded portion 18.

It is particularly desired that the plurality of ribs 38 are arranged at an angle which is tilted with respect to the radial direction, and that the direction of inward inclination of the ribs 38 is in agreement with the direction of opening the closure shell

from the standpoint of easily opening the closure. This is because, with the outer periphery of the mouth being intimately sealed in accordance with the present invention, a slightly large torque is required for opening the closure. With the ribs being arranged as described, however, the closure can be opened by hand relatively easily.

Reference is now made to Figs. 9 to 12 that illustrate the shape of the annular protruded portion of the container closure shell. Referring to Fig. 9, the annular protrusion 18 has a shape that becomes narrow inwardly toward the end thereof and further has the outer peripheral surface 19b that is inwardly tilted. The inner peripheral surface 19 of the annular protruded portion 18 is vertical. In an example of Fig. 10, the annular protruded portion 18 has a shape that becomes narrow inwardly toward the end thereof and further has the outer peripheral surface 19b that is inwardly tilted like the above-mentioned example. In this case, however, the inner peripheral surface 19 of the annular protruded portion 18 is slightly and inwardly tilted, too. In an example of Fig. 11, the annular protruded portion 18 has a shape that becomes narrow inwardly toward the end thereof and further has the outer peripheral surface 19b that is inwardly tilted. In this case, however, the annular tilted portion 18 has a flexible tip 20 that is inwardly protruded. In an example of Fig. 12, the annular protruded portion 18 has a shape that becomes narrow inwardly toward the end thereof and further has an outer peripheral surface 19b that is inwardly tilted. In this case, the inner peripheral surface 19 of the annular protruded portion 18 is vertical but has a flexible tip 20 that is tilted slightly inwardly.

The container closure shell should have a rigidity which is large enough to maintain sealing performance based upon the liner despite a pressure difference between the inside and the outside of the container, and should be made of a variety of plastics. Examples of the plastics may include high-density polyethylene, polypropylene, thermoplastic polyester, polyamide, styrene resin, ABS resin and the like. The shells will have such shapes as crown, screw cap, pilfer-proof cap, lag cap, etc.

According to the present invention, the liner stands for the one that is fitted to the container closure shell, molded at that place into a shape necessary for accomplishing the sealing, and has required cushioning property and softness. Examples of the resin for molding the liner include olefin resins such as low-, medium- or high-density polyethylene, isotactic polypropylene, propylene/ethylene copolymer, polybutene-1, ethylene/propylene copolymer, ethylene/butene-1 copolymer, propylene/butene-1 copolymer, ethylene/propylene/butene-1 copolymer, ethylene/vinyl acetate copolymer, ionically cross-linked olefin

copolymer (ionomer), or blends thereof.

The above-mentioned olefin resins can be used being further blended with other elastomers such as ethylene/propylene copolymer rubber, ethylene/propylene/diene copolymer, SBR, NBR or thermoplastic elastomer.

Moreover, the liner may be molded by using a gel which is obtained by dispersing a vinyl chloride resin plastisol, i.e., a vinyl chloride resin in a plasticizer, or by using a gel which is obtained by dispersing an acrylic resin plastisol, i.e., an acrylic resin in a plasticizer followed by heating.

It is desired to use a blend of olefin resins from the standpoint of heat moldability. The liner used in the present invention may be provided with a resin layer containing a disoxidant. The liner may be made up of a resin containing the disoxidant alone or may be a composite material with the resin containing the disoxidant and another liner.

It is quite natural that the inner peripheral surface 19 of the annular protruded portion 18 has a diameter ( $r$ ) which is larger than the diameter ( $R$ ) of the outer peripheral sealing portion at the mouth of the container that is to be sealed but is smaller than the diameter of the threaded portion for engagement with the mouth of the container, and should hold the following relationship with respect to the thickness ( $d$ ) of the substantially vertical portion 21 of the liner, i.e.,

$$r > R > r - d$$

The height and thickness of the annular protruded portion 18 may differ depending upon the entire size of the container closure. Generally, however, the height should range from 1.6 to 2.3 mm and, particularly, from 2.0 to 2.2 mm, and the thickness should range from 0.2 to 0.5 mm and, particularly, from 0.3 to 0.4 mm.

Moreover, the substantially vertical portion (falling portion) 21 of the liner should have a thickness of from 0.4 to 1.0 mm and, particularly, from 0.5 to 0.8 mm, and a biting portion between the substantially vertical portion (falling portion) 21 of the liner and the outer peripheral sealing portion of the mouth of the container should have a size ( $R - (r - d)$ ) of from about 0.2 to about 0.4 mm.

The container closure of the present invention permits a variety of modifications. In many cases, for instance, intimate adhesiveness is obtained to a very satisfactory degree between the container closure shell and the liner. In order to accomplish perfect adhesion, however, an adhesive may be applied to the inner peripheral surface of the container closure or the liner may be blended with a component for imparting adhesiveness. It is also possible to provide protrusions on the inner surface of the top panel of the container closure shell to

increase mechanical engagement relative to the liner.

### Claims

1. A plastic container closure with liner comprising a top panel of the plastic container closure, a skirt portion which downwardly extends from the peripheral edge of said top panel and has a thread formed in the inside thereof to come into engagement with the mouth of the container, an annular protruded portion that is formed inwardly from the inner surface of said top panel and on the inside of a portion near the root of the skirt maintaining a small gap therebetween, and a sealing liner that is fitted by press-molding on the inside of said top panel, wherein a substantially vertical portion is formed on said liner along the inner surface of said annular protruded portion, and sealing performance is maintained by the engagement between the outer edge of the mouth of the container and the substantially vertical portion of the liner.
2. A plastic container closure according to claim 1, wherein the inner peripheral surface of said annular protruded portion is provided substantially vertically to the top panel, the inner peripheral surface of the annular protruded portion has a diameter larger than that of the mouth of the container that is to be sealed but is smaller than the diameter of the threaded portion that engages with the mouth of the container.
3. A plastic container closure according to claim 1, wherein said annular protruded portion has a shape that becomes narrow toward the tip thereof and has an outer peripheral surface that is tilted inwardly.
4. A plastic container closure according to claim 1 or 3, wherein said annular protruded portion has a flexible tip of which the inner peripheral surface is slightly tilted inwardly toward the end thereof or has a tip that is inwardly protruding.
5. A plastic container closure according to claim 1 or 3, wherein said annular protruded portion has an inner peripheral surface that is substantially vertical.
6. A plastic container closure according to claim 1 or 3, wherein said annular protruded portion has the inner peripheral surface that is tilted slightly inwardly.
7. A plastic container closure according to claim 1, wherein a plurality of ribs are arranged along the circumference between the annular protruded portion and a portion near the root of the skirt to bridge them together.
8. A plastic container closure according to claim 4, wherein said plurality of ribs are arranged at an angle that is tilted relative to the radial direction.
9. A method of producing a plastic container closure with liner, comprising:
  - feeding a resin for molding the liner into the inner surface of a top panel of a plastic container closure which has the top panel, a skirt portion which is threaded in the inside thereof for engagement with the mouth of a container, and an annular protruded portion that stands nearly upright from the inner surface of the top panel maintaining a small gap from the skirt portion;
  - arranging a core having a tip for molding the central portion of the liner, an intermediate bush having a tip for molding a sealing portion of the liner, and an outer sleeve having a tip for engagement with said annular protruded portion of the container closure, in concentric with one another;
  - advancing said tips toward the top panel of the container closure, so that said tip for engagement is brought into engagement with the annular protruded portion of the container closure and that said tip for molding the sealing portion of the liner is brought into engagement with the top panel of the container closure;
  - pressing in this state the resin for molding the liner using the core, so that the intermediate bush is retreated by the resin pressure; and
  - flowing the resin into space defined by said tip for molding the sealing portion of the liner, said tip for engagement, peripheral portion on the inner surface of the top panel, and inner side surface of said annular protruded portion, thereby to mold the central portion of the liner having a reduced thickness, to mold the peripheral portion of the liner having a thickness larger than that of the central portion, and to mold a substantially vertical portion of the liner on the inner side surface of said annular protruded portion.

## FIG. I

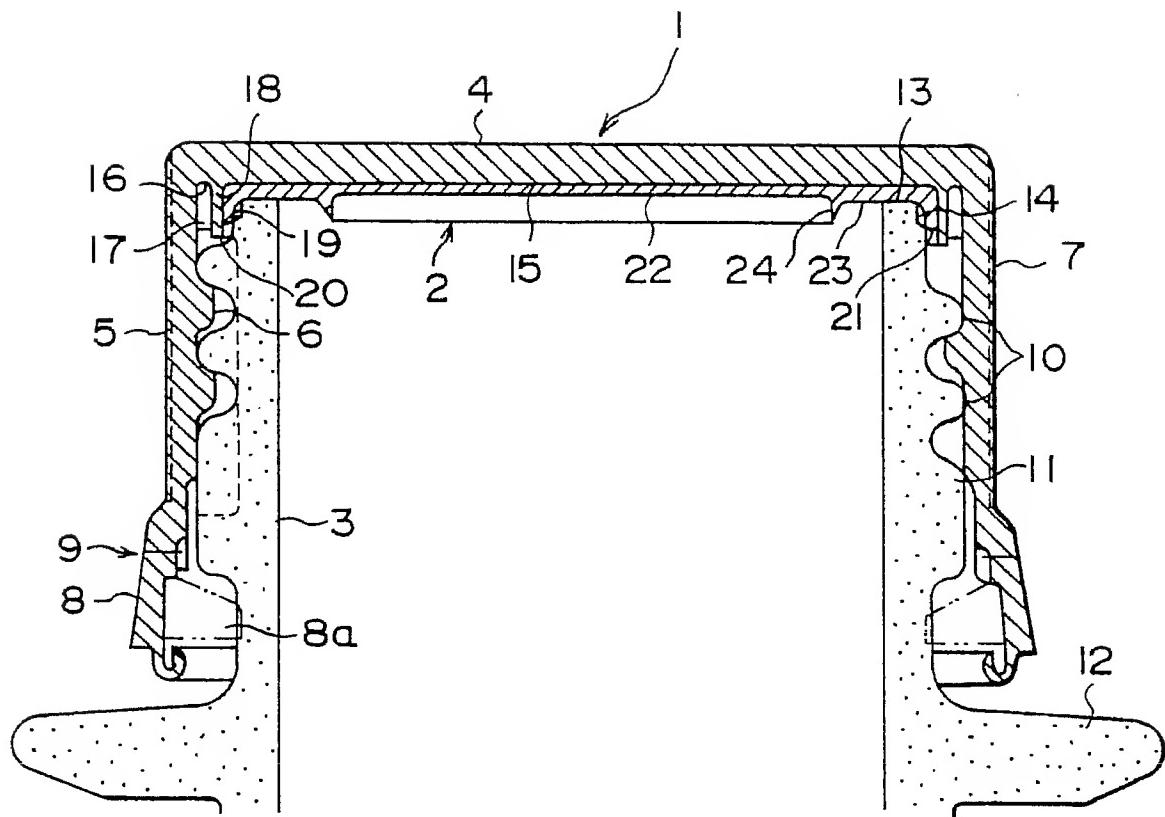


FIG. 2

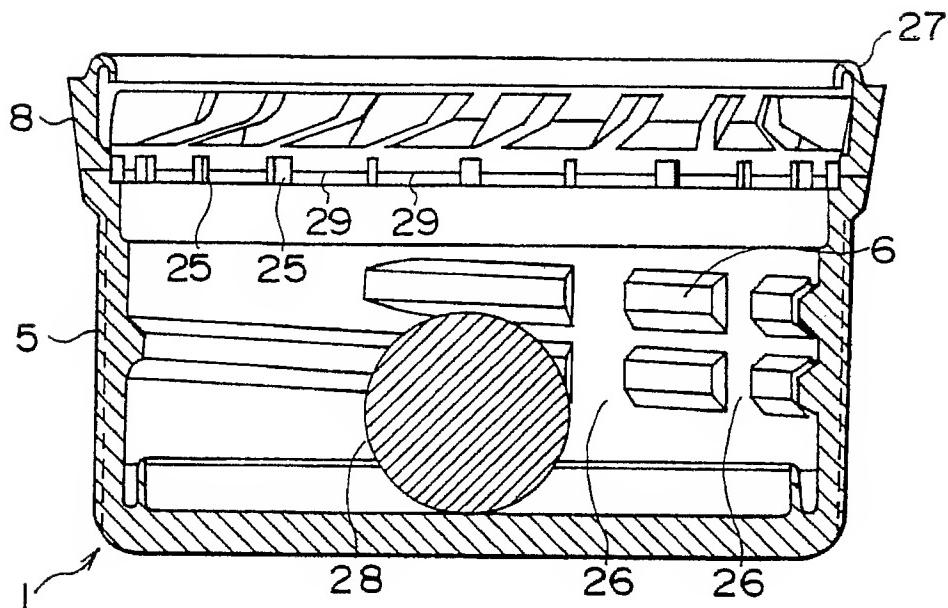
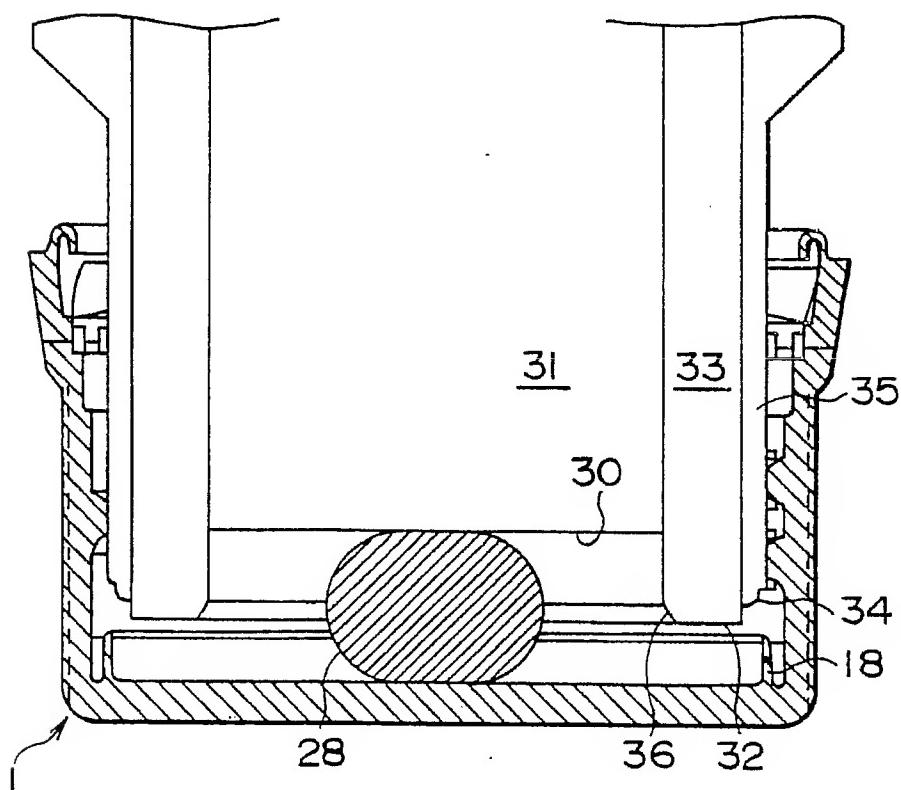
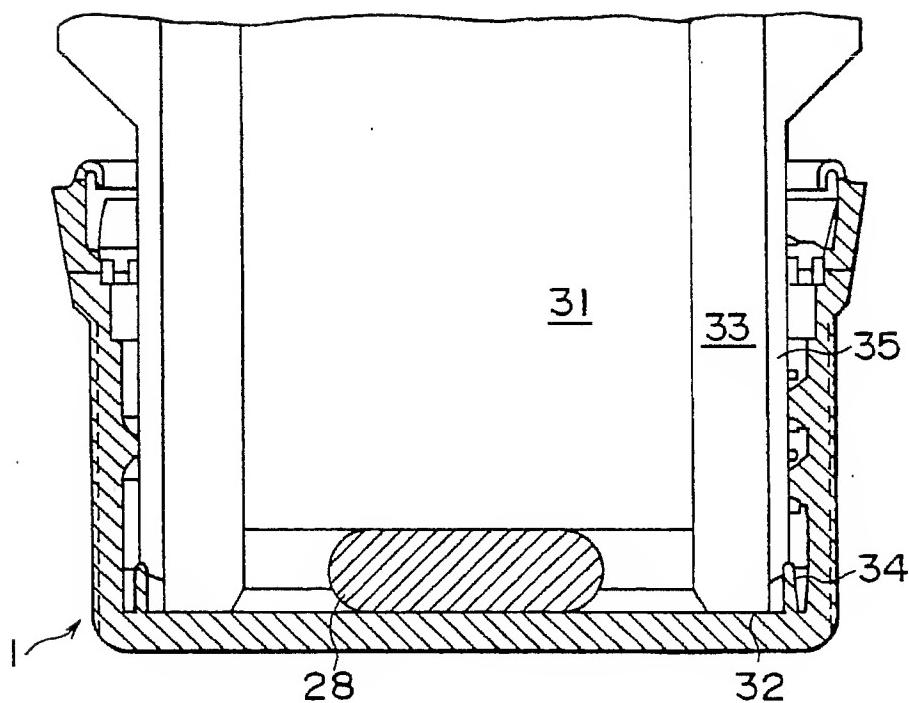


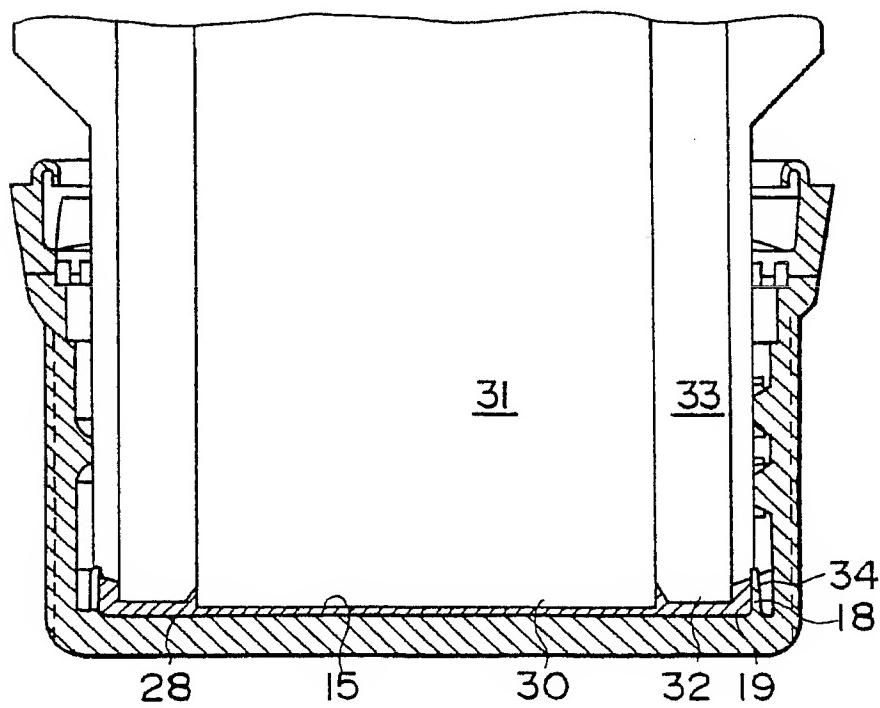
FIG. 3



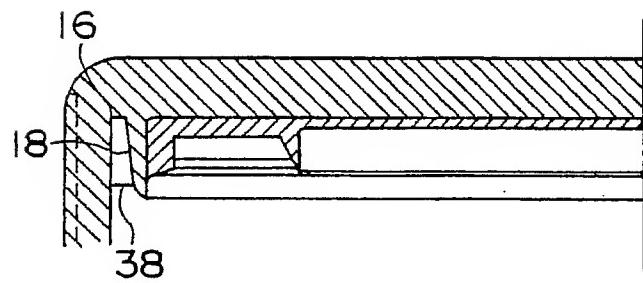
F I G. 4



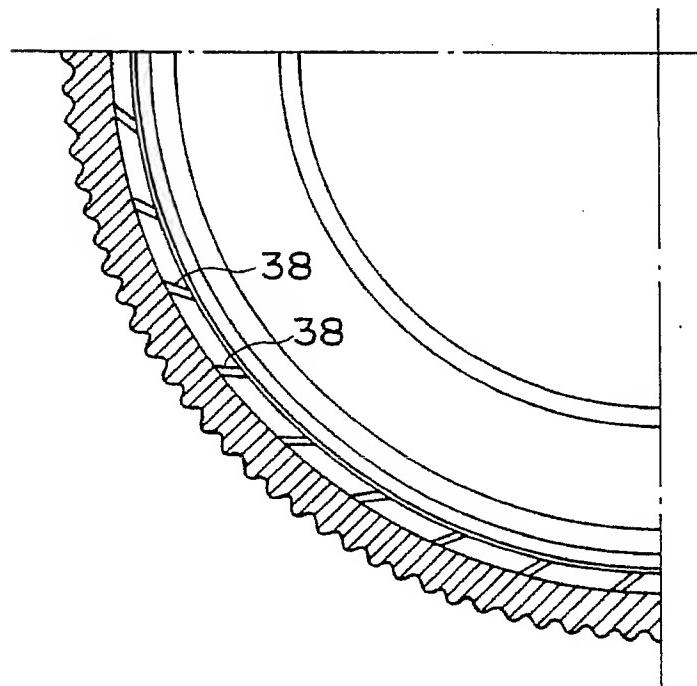
F I G. 5



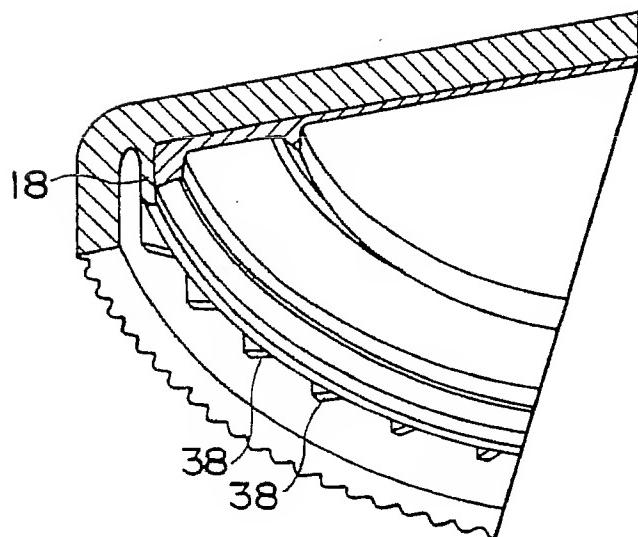
F I G. 6



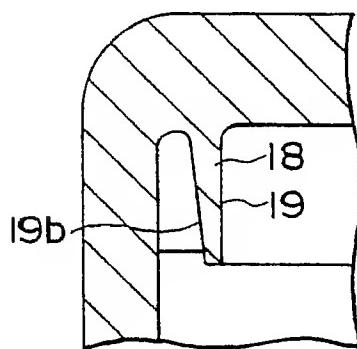
F I G. 7



F I G. 8



F I G. 9



F I G. 10

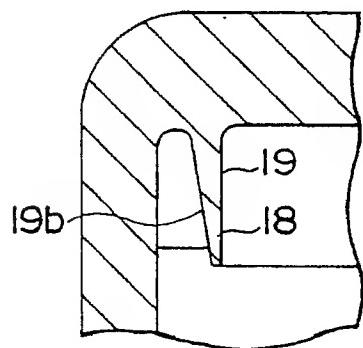


FIG. 11

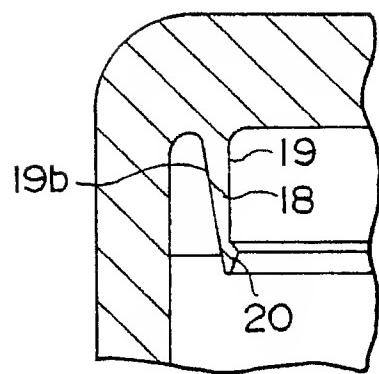
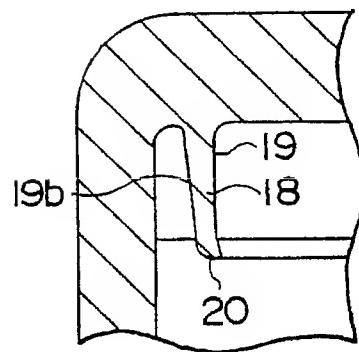


FIG. 12





European Patent  
Office

## EUROPEAN SEARCH REPORT

Application Number  
EP 95 30 1511

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	WO-A-85 00154 (BEV-CAP PLASTICS) * abstract; figures * ---	1,9	B65D41/04
A	US-A-4 721 221 (BARRIAC) * column 4, line 15 - line 59; figures * ---	1,9	
A	FR-A-2 514 326 (H-C INDUSTRIES) * page 4, line 22 - page 5, line 14; figure 1 * ---	1,9	
A	US-A-3 547 746 (GWINNER) * column 4, line 49 - column 5, line 30; figures 3,4 * -----	9	
TECHNICAL FIELDS SEARCHED (Int.Cl.6)			
B65D			
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	3 October 1995	Newell, P	
CATEGORY OF CITED DOCUMENTS			
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A : technological background	D : document cited in the application		
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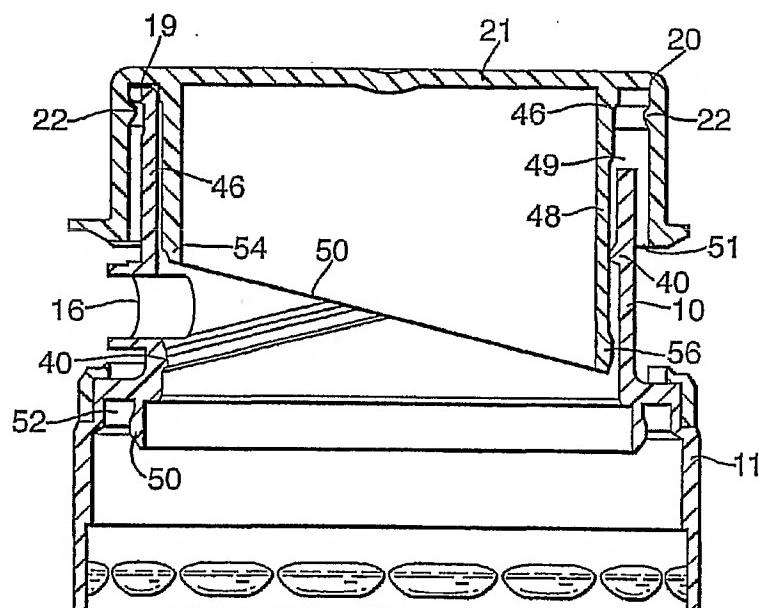
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[Continued on next page]

(54) Title: VALVE



(57) Abstract: A valve for use as a fluid flow regulator having an inner part (20) and an outer part (10), which are moveable relative to one another. At least one of the inner or outer parts is connected to a source of fluid. One of the parts is fixed whilst the other is movable and the outer part has at least one orifice (16), through which fluid may be dispensed when the valve is "open". The moveable part is free to rotate about its axis, but axial movement is prevented and when the valve is in its closed position, the inner part (20) and the outer part (10) are arranged relative to one or more sealing olives (40) to prevent fluid from flowing axially over the sealing olive (40) and out through the orifice (16). The sealing olive (40) may be arranged to be resiliently biased into engagement with the inner part (20) when the valve is closed.

WO 2006/008285 A1

## Description

### VALVE

- [001] This invention relates to a valve for regulating the flow of a fluid. Although the valve may be used for other purposes, for the ease of explanation one embodiment will be described with regard to its use as a dispensing valve, wherein the dispensing valve is associated with a container containing a fluid to be dispensed.
- [002] Such a dispensing valve is known from patent FR 2732316 --.
- This dispensing valve comprises a fixed part, forming the dispensing valve body, adapted for attachment to a container. This fixed part extends away from the container in a generally cylindrical shape and is open at its two axial ends. The fixed part is also pierced by a lateral fluid outlet orifice and an air inlet orifice. These two orifices are positioned approximately opposite each other in the walls of the fixed part. The dispensing valve furthermore comprises a moveable part, which has a closure part of generally cylindrical shape, which is tightly fitted inside the fixed part. This moveable piece is open at its internal axial end. In the generally cylindrical wall of this moveable part are two cutouts positioned approximately opposite each other. The external axial end of the moveable part is closed by a plate, which extends radially beyond the generally cylindrical wall thus providing a rim, which may be gripped by a user. A seal is created between the cylindrical walls of the tightly fitted inner moveable part and the outer fixed part.
- [003] Accordingly, when the cutouts of the moveable inner part are completely out of radial and/or axial alignment with the orifices of the fixed outer part no fluid may pass from the container to the outside via either of the orifices.
- [004] This known dispensing valve further comprises a tamper evident band, which is located in the form of a skirt between the radially distal edge of the plate and the fixed outer part. This tamper evident band prevents the inner moveable part from being moved, from its initial position, in relation to the outer fixed part of the dispensing valve.
- [005] In use, the tamper evident band is first removed. This allows the user to pull the inner moveable part axially away from the outer fixed part. By doing this, the two cutouts in the wall of the inner moveable part are positioned axially in line with the two orifices in the outer fixed part. The user may then twist the inner moveable part causing the two cut-outs to line up radially with the two orifices. Thus when the fluid is brought into contact with the dispensing valve by means of tilting of the container or squeezing of the walls of the container, the fluid in the container may pass through the outlet orifice and air may enter the container through the inlet orifice. To regulate the

flow of fluid the inner moveable part may be twisted so that more or less of the cut-outs and orifices radially line up.

[006] When the desired amount of fluid had been dispensed the user must twist the inner moveable part relative to the outer fixed part so that the cut-outs and the orifices are radially out of alignment. Although this closes the container, for a better seal the user must then push the inner moveable part axially back towards the container.

[007] A first drawback of this dispensing valve is that two hands are required to initially operate it, since the outer fixed part must be braced while the inner moveable part is pulled out. A second drawback is that the user must undertake two actions in order to provide a route for the fluid to reach the orifice. The first action is to pull the inner moveable part axially away from the fixed outer part, and the second action is to twist the inner moveable part relative to the fixed outer part. After use, the user must rotate the inner moveable part relative to the outer fixed part and then push the inner moveable part axially into the outer fixed part to reseal the container.

[008]

US 3690520 --.

describes a similar valve arrangement in which the valve must be pulled axially to bring the dispensing orifices in an inner and outer part into axial alignment, before being twisted to align the orifices radially so that fluid may be dispensed from the container. This valve suffers from the same drawback described above.

[009]

WO 0030949 --.

and

DE 9016299 U --.

describe an alternative arrangement in which movement of the valve again has two components (an axial component and a rotational component), but movement of the valve between its open and closed positions is effected by means of a screw thread arrangement. The screw thread arrangement provides both rotational and axial components of movement simultaneously and therefore a single twisting motion allows the orifices to be aligned both axially and rotationally in much the same way as described above. This arrangement has the advantage that a user may open the valve using a single twisting motion. However the disadvantage of all the valves described above is that upon opening, the axial length of the valve must increase. This is undesirable where space is restricted (for example when the container / valve is stored in a refrigerator) or where the valve is prone to receiving an impact whilst open.

[010]

The object of the present invention is to provide a valve, which may be used for regulating the flow of a fluid, wherein the drawbacks described above are overcome. In other words, the present invention provides a valve, which may be operated by only

- [020] Figure 7 shows a cross-section through a dispensing valve where the inner part is fixed and the outer part is relatively rotatable.
- [021] Figure 8 shows a cross-section through another dispensing valve where the outer part is fixed and the inner part is relatively rotatable.
- [022] Figure 9 shows a cross-section through another dispensing valve where the outer part is fixed and the inner part is relatively rotatable and where two olive seals are provided.
- [023] Figure 10 shows view of a variation of the inner part shown in Figure 9.
- [024] Figure 11 shows a cross-section through a yet further example of a dispensing valve.
- [025] In the following description terms such as "upper" and "lower" refer to the views shown in the figures and are not limiting on the orientation of the valve in use. Further, the term "axis of the valve" is hereby defined as the vertical axis as shown in the figures, and is the axis to which the terms "axial", "radial" and "circumferential" relate.
- [026] Referring to Figures 1 to 3, the dispensing valve comprises two parts. The first is the fixed outer part 10. This is generally cylindrical and open at both axial ends. One end (the lower end shown in Figure 1) is fixed to a container. The second part is the moveable inner part 20, which is also generally cylindrical. This fits inside the fixed outer part 10 and is open axially at the lower end. The opposite end is closed by a plate 21, which extends radially outward from the perimeter of the wall 46 of the moveable inner part 20. It also extends radially outward from the wall 14 of the fixed outer part. A skirt 25 depends downwardly from the circumference of this plate 21 so that it forms a wall radially outward from the wall 14 of the fixed outer part. Accordingly, a portion 14 of the fixed outer part 10 is sandwiched between the moveable inner part's inner wall 46 and the moveable inner part's outer skirt wall 25. This outer skirt 25 may be textured for improved grip.
- [027] A tamper evident feature 30 in the form of a band is fitted axially around the dispensing valve. The upper edge of this band is joined to the lowest edge 23 of the outer skirt 25. The lower edge of this band is joined to a tamper evident collar 34, which rests on the fixed outer part's shoulder 9. The joins between the lower edge 23 of the skirt 25 and the tamper evident band 30 and between the tamper evident band 30 and the tamper evident collar 34 may comprise frangible bridges 32 which are well known in the art.
- [028] Radially inside the tamper evident collar 34 teeth (not shown) are provided which interact with other teeth (also not shown) situated on the radially outward edge of the shoulder 9. These two sets of teeth fit together so that radial movement of the tamper evident collar 34 relative to the shoulder 9 of the fixed outer part 10 is prevented. Thus,

the moveable inner part 20 is prevented from being twisted relative to the fixed outer part 10 with the tamper evident band 30 in place since the moveable inner part 20 and the fixed outer part 10 are joined together.

[029] The radial inner face of the tamper evident band 30 covers the spout. To remove the tamper evident band 30 a rip-tab 31 is provided. The user grasps and pulls this rip-tab 31 thus tearing the joins 32 between the tamper evident band 30 and the lower edge 23 of the outer skirt 25 and between the tamper evident band 30 and the tamper evident collar 34 to allow the tamper evident band's 30 removal. Upon removal of the tamper evident band 30, the moveable inner part 20 may be twisted relative to the fixed outer part 10.

[030] Also visible in Figure 2 is a channel 52 for receiving the neck of the container (not shown). The neck of the container may be screwed into a receiving collar 11 of the fixed outer part 10 by means of screw threads (not shown) located on the inner face of the receiving collar 11 interacting with corresponding screw threads on the outer face of the neck of the container. A bore-seal 51 depends downwardly from the fixed inner part 10 so that it enters the neck of the container (not shown), and thus provides a seal between the container and the dispensing valve in a manner well-known in the art. Alternatively, the container and fixed outer part 10 may not have screw threads. Instead, the two articles may be held together with snap beads 13 which are also well known in the art. If screw threads are employed, as opposed to snap beads, a further tamper evident band (not shown) may be positioned at the base of the fixed outer part 10 so that the container may not be unscrewed without breaking this band thus assuring the customer that the fluid has not been tampered with prior to purchase and subsequent use.

[031] Figure 3 shows a side view of the dispensing valve after the tamper evident band 30 has been removed. After the removal of the tamper evident band 30 the spout may be seen. This spout surrounds an orifice 16, which passes through the wall 14 of the fixed outer part 10. Above the spout is a projection 18, projecting radially outward from the wall 14 of the fixed outer part 10. This projection 18 acts as a stop to limit rotation of the outer skirt 25 relative to the fixed outer part 10 by blocking the rotational movement of a projection (not shown) located on the inner face of the outer skirt 25.

[032] The interaction between the fixed outer part 10 and the moveable inner part 20 will now be described with reference to Figures 3 to 5. A bead 22 located on the radially inner face of the skirt 25 interacts with a flange 19 located on the radially outer face of the wall 14 of the fixed outer part 10. Thus the fixed outer part 10 and the moveable inner part 20 are held together in the well-understood manner of snap-beads. However, flange 19 does not necessarily extend completely around the whole of the circumference of the radially outward face of the fixed outer part 10. The reason for this

will be explained later. Further, bead 22 does not necessarily extend completely around the whole of the circumference of the radially inner face of the skirt 25.

[033] On the radially inner face of the wall 14 of the fixed outer part 10 an olive seal 40 is provided which projects radially inward. This seal 40 extends all of the way around the inner circumference of the wall 14. The axial position of this seal 40 varies circumferentially in that it lies in a plane which is angled in relation to the axis of the valve at approximately 80 degrees. Further, the seal 40 is positioned so that the lowest portion, nearest to the container, lies approximately adjacent to the orifice 16 and between the orifice 16 and the container. The uppermost portion of the seal 40, furthest from the container, lies at a point, which is approximately diametrically opposite radially from the orifice 16.

[034] The inner moveable part 20 comprises a generally cylindrical wall 46, which downwardly depends from the plate 21. This plate 21 blocks the one axial end of the moveable inner part 20. This generally cylindrical wall 46 is of varying axial length so that its lower end 50 lies in a uniform plane, which is angled to the axis of the dispensing valve by approximately 80 degrees. When the dispensing valve is in the fully closed position, the moveable inner part 20 is positioned so that the lower end 50 of the wall 46 is lying circumferentially coincident with the seal 40. The lower end 50 of the wall 46 contacts the seal 40 so that interference is created therebetween. This may be achieved, for instance, by the seal 40 squeezing the lower end 50 of the wall 46 radially inwards, or vice-versa. This interference creates a fluid-tight seal.

[035] Further, the very end 50 of wall 46 may be reduced in diameter to create a shaped edge 54 (refer to Figures 4 and 5). This shaped edge 54 is provided circumferentially about the outer radial face of the wall 46 so that this end of the outer face of the wall 46 has a diameter less than the outer face of the wall 46 above. The purpose of this shaped edge will be explained in more detail below.

[036] With the dispensing valve in the closed position, fluid held within the container may not pass through the orifice 16 nor axially over the seal 40 since the wall 46, together with plate 21, are blocking its passage and the lower end 50 of the wall 46 is sealed against the seal 40.

[037] Although an angle of 80 degrees to the axis of the dispensing valve has been described for the seal 40 and the lower end 50 of the wall 46, other angles are possible. The only limitation is that the orientation of the olive seal 40 and lower end 50 of wall 46 must allow fluid to flow axially over the seal 40 when the moveable inner part 20 has been rotated relative to the fixed outer part 10 away from the closed position. Further examples of the orientation of the olive seal 40 and lower end 50 of wall 46 are given below.

[038] In Figure 4, the dispensing valve is partially open. This has been achieved by

rotational movement of the moveable inner part 20 relative to the fixed outer part 10. As may be seen, since the two parts 10,20 have been rotated relative to one another, although the seal 40 on the inner face of the fixed outer part 20 has remained stationary relative to the container, the lower end 50 of the wall 46 of the moveable inner part 20 has moved so that it is no longer coincident with the seal 40. Accordingly there is now no sealing effect between the lower end 50 of the wall 46 and the olive seal 40. Accordingly, fluid held in the container may pass axially over the olive seal 40 and travel around the radially outer face of the wall 46 in the narrow gap 47, which exists between this outer face and the radially inner face of the fixed outer part 10. Such fluid may then reach the orifice 16 and be dispensed. This may occur even though the wall 46 still covers the entire area of the orifice 16. This is because there is no sealing effect between the outer face of the wall 46 and the orifice 16.

[039] As the moveable inner part 20 is rotated further, the wall 46 is drawn away from behind the orifice 16 so that not only may fluid pass along the gap 47 between the wall 46 and the fixed outer part 10 but it may also travel directly from the container to the orifice without hindrance. Such a situation is exemplified in Figure 5.

[040] Figure 5 also shows that the wall 14 of the fixed outer part has another orifice in the form of a cut-out section at its uppermost end and on the circumferential portion approximately opposite to the orifice 16. Accordingly, flange 19 does not necessarily extend completely around the whole of the perimeter of the radially outward face of the fixed outer part 10, as described above. Also, the wall 46 of the moveable inner part 20 has a portion of reduced thickness 48. The cut-out portion of wall 14 and the reduced thickness portion 48 of wall 46 overlap axially so as to create a gap 49. Accordingly, when fluid is being dispensed via the orifice 16, air may enter the dispensing valve and thus the container via the following route. Firstly, air may enter through a gap 51 located between the moveable outer part 20 and the fixed inner part 10. It then may pass over the top of the fixed inner part 10 and through the gap 49. From here, air may then travel through the space between the fixed inner part 10 and the wall 46 of the moveable inner part 20 by means of the reduced thickness portion 48. Finally, air may then travel into the inner space within the dispensing valve and thus into the container. The advantage of this route is to allow the free passage of air to reduce or eliminate so-called "glugging" and improve the smooth flow of the fluid as it is dispensed.

[041] With regard to the seal 40, it has already been described how the very end of the wall 46 has a shaped edge 54. This shaped edge 54 produces the advantage that the lower end 50 of the wall 46 may be brought into contact with, and moved away from, the olive seal 40 in a smooth manner. This smooth manner is further enhanced by the nature of typical olive seals, which have a rounded profile. This rounded profile thus

provides a lead-in edge (not shown) on the upper edge of olive seal 40. It is the combination of the shaped edge 54 in conjunction with this lead-in edge that enhances the smooth manner in which the interference of the olive seal 40 with the lower end 50 of wall 46, and thus the sealing effect, may be increased and decreased. For example, the lower end 50 of wall 46 or olive seal 40 may move from a compressed state to an uncompressed state in a smooth manner.

[042] A further advantage of the embodiment described above is that with the olive seal 40 and the end of the wall 50 angled to the axis of the valve, as the user opens the valve, by rotating the moveable part relative to the fixed part, the resistance created by the interference between the olive seal and wall end 50 reduces. This is because by rotation of the two parts relative to one another, the seal 40 and wall end 50 move away from each other axially so that there is less contact between the two and hence less friction.

[043] Although the above embodiment has been described with the olive seal 40 lying on the radially inner surface of the outer part 10 interacting with the end of the wall 50 of the inner part 20 to produce a sealing effect, it would also be possible to have a seal on the radially outer surface of the inner part. This seal could be in the form of another olive seal and would interact with the olive seal 40 on the fixed part 10. This seal would be moved into and out of contact with the olive seal 40 in the same manner as described above with reference to the end of the wall 50. Such an embodiment is shown in Figure 6, where it may be seen that since the sealing effect is provided by corresponding seals 140 on both of the inner and outer parts there is no need for the lower end of the inner depending wall 46 to lie in a plane parallel with the sealing zone 140.

[044] Figure 7 shows a further embodiment wherein the inner part 20 is fixed and the outer part 10 is moveable relative to the fixed part 20. The outer part has an end plate 21 and at least one orifice 16 is provided in the wall, which depends downwardly from this end plate 21. A seal zone 140 is created by having, for instance, seals on the radially inner surface of the moveable outer part and the radially outer surface of the fixed inner part, which interact to produce a sealing effect in the same manner as described above.

[045] When the user wishes to dispense fluid from the container (unreferenced), the outer part 10 is rotated relative to the inner part 20 so that the sealing effect is disrupted at the sealing zone 140. Accordingly, fluid may then flow over the top of the inner wall in a weir-like manner and axially over the seals to reach the at least one orifice 16, when fluid is brought into contact with the dispensing valve by either tipping or squeezing of the container.

[046] It would also be possible to produce a dispensing valve wherein the lower end of

the depending wall of the outer part lies in the same plane as a seal on the radially inner wall of the outer part 120 so that they interact together in the same manner as described with reference to Figures 1 to 5. This would remove the need for a separate seal on the radially inner surface of the outer part 120. This embodiment is not shown in the figures. The end of the wall of the outer part may also be chamfered.

[047] Figure 8 shows an embodiment wherein the outer part 10 is fixed, the inner part 20 is moveable relative to the fixed part, and the inner part 20 has an end plate 21 in a similar manner to the embodiment shown in figures 1 to 4. In this embodiment a seal 40 is provided on the radially outer face of the moveable inner part 20. This seal 40 is pressed against the radially inner surface of the fixed outer part 10 to create a fluid-tight seal. However, this seal 40 does not lie in a uniform plane all about the circumference. Rather, the seal 40 has most of its length lying in a plane which is below the orifice 16 but also includes a section 40a which rises above the lower level of the at least one orifice 16. When the inner part 20 is in a position such that this section 40a of seal 40 is radially completely out of alignment with the orifice 16, no fluid can pass axially over the seal 40 and through the orifice 16. Accordingly, fluid may not be dispensed via the orifice 16 from a container connected to the fixed part 10. When the inner part 20 is rotated relative to the fixed outer part 10 and the section of seal 40a either overlies the orifice 16 or surrounds it, fluid may pass from the container to the orifice 16.

[048] Although only one section 40a of the seal 40 has been shown to deviate from the depicted horizontal section, there may of course be other sections which also do this and which also may be brought into correspondence with orifices.

[049] As discussed earlier, the invention may not be limited to use with conventional bottles but may also be used with pipes and other fluid retaining structures. Figure 9 shows an example of this. In this figure, a pipe has a fixed outer part 210 with at least one orifice 16. A moveable inner part 220 is provided. In this example this inner part may be rotated by means of a motor 230, although other forms of rotation will be evident to those skilled in the art.

[050] Two sealing zones 240 are created, one axially either side of the orifice 16. These zones are created by olive-type seals lying on the radially outer surface of the moveable inner part 220 interacting with two corresponding olive-type seals lying on the radially inner surface of the fixed outer part 210. These seals are shown as lying in two uniform planes inclined to the horizontal. However, they do not necessarily have to lie in uniform planes, as long as in at least one rotational position the seals on the inner and outer parts align and interact to provide a fluid-tight seal, and further, when the moveable inner part 220 is rotated relative to the fixed outer part 210 the interaction of the seals is disrupted. When the seals are in full correspondence about the

circumference of the pipe 210, no fluid may pass from inside of the pipe 210, axially over the seals and through the orifice 16. However, when the sealing effect is disrupted by relative rotation fluid may pass axially over the seals and via the orifice 16.

[051] The moveable inner part has two axial ends 225. These ends may be either closed or open. If the ends are closed then when the inner 220 and outer 210 parts are in a rotational position relative to one another such that a sealing effect is created, no fluid may not only pass through the orifice 16 but may also not pass axially along the pipe 210 from one side to the other of the inner part 210.

[052] Further, the sealing zones 240 could be arranged such that when the upper zone has a sealing effect the lower zone is disrupted so that fluid may flow from the lower end of the pipe 210 through the orifice 16 and vice versa. This could be used to alternately dispense two fluids each having their source at opposite ends of the pipe 210.

[053] To reduce the number of seals from four, in the above embodiment, to one, figure 10 shows a further embodiment. In this figure only the moveable inner part 220 is shown. It has one seal 40 in the shape of a lower, almost completely circumferential, plane and an upper, also almost completely circumferential, plane. These two planes are connected together so that both left hand ends of the upper and lower planes are connected and both right hand ends are connected. A gap 40B is thus created in the seal so that a quadrant of the circumference of the radially outer surface of the inner part 220 has no seal. The seal 40 is, however, continuous.

[054] There is no need for a further seal on the radially inner surface of the fixed outer part 210, although this is possible, since the seal 40 is pressed against the inner surface of the pipe 210 to produce the sealing effect between inner and outer parts.

[055] When the inner part 220 is in at least one rotational position relative to the pipe 210, the orifice 16 will lie in a portion between the upper and lower planes of the seal 40 and radially completely out of alignment with the gap 40B. Accordingly no fluid within the pipe 210 may pass axially over the seal 40 and through the orifice 16. Conversely when the inner part 220 is rotated relative to the pipe 210 there will come a point where the orifice overlies the seal 40 or is situated completely inside the gap 40B. At this point fluid may pass through the orifice 16.

[056] Although all of the above description and referenced figures have been in relation to two cylinders which are co-axially fitted one inside the other, it should be apparent that the inner and outer parts do not necessarily have to take this form. Figure 11 shows a fixed outer part 410 of varying cross-sectional shape (a spherical main body surmounted by a widening mouth part with a neck portion 410A axially there between) and a moveable inner part 420 also of varying cross-sectional shape (a frusto-conical asymmetric form).

[057] A sealing zone 440 is provided between the radially outer surface of the inner part

420 and the radially inner surface of the outer part 410. This sealing zone may be created by olive seals lying on at least one of these two surfaces as described above with reference to figures 1 to 8. The lower end of the wall of the inner part 420 may also be used to produce the sealing effect in conjunction with one olive seal as described above with reference to figures 1 to 5. Rotation of the inner part 420 relative to the outer part 410 disrupts the sealing effect and allows fluid to pass through orifice 16.

[058] Accordingly, it is apparent that the only requirement of the shape of the two parts is that they allow relative rotation there between. This rotational movement need not be 360 degrees. In fact rotation by only a few degrees would be sufficient to disrupt the seal.

[059] One possibility that also needs to be mentioned is that of the two parts having an oval shape (in plan view). At first sight it might be thought that these two shapes would not allow relative rotational movement. However, if the material of which at least one of the parts consists has a resilient nature, it would be possible for the moveable part to rotate between two bistable positions. Once this concept is understood it will become apparent that other shapes are equally possible.

[060] Further, in the above embodiments it has been explained that olive seal 40 could interact with a second seal, possibly in the form of another olive seal. However, this second seal could in fact be a stepped portion on the surface of one of the corresponding walls.

[061] Further still, the above description has been primarily phrased from the point of view of the dispensing valve allowing fluid to pass radially through an orifice. However, it should be understood that the container, bottle or pipe could in fact have a vacuum present inside. Accordingly, the valve would not be dispensing in the sense that fluid flows radially outwards, but rather that it controls fluid entering the container, bottle or pipe to fill the vacuum.

[062] Yet further, all of the above described embodiments allow the flow of fluid to be regulated by relative movement of one part to another. This flow may be regulated from none to a maximum and vice versa.

[063] Even further, the orifices could be in the form of a group of relatively small holes or of several relatively large holes. This would enable a user to choose between different types of dispensing such as sprinkling or pouring.

[064] In one particular use, the dispensing valve may be attached to a container, which lies on its side so that the dispensing valve is located at right angles to that shown in the figures. In such a case, the orifice would be located on the lowest side of the dispensing valve for optimum operation. An example of use of the above described dispensing valve is with a five litre bottle of water, which may be kept in a refrigerator

on its side. When the user wishes to dispense water, once the tamper evident band has been removed, they merely need to place a receptacle underneath the orifice and rotate the moveable part of the dispensing valve to dispense the required amount, reversing the movement afterwards to close the dispensing valve. This means that a user only needs one hand to operate the dispensing valve, so that the other hand may be used to hold the receptacle. Further, because of the smooth nature of rotation and of the sealing and unsealing action, a smooth and controlled flow of fluid from none to the desired maximum, without any sudden movement or jerking of the container, which can often lead to spillage, may be achieved.

[065] Although this example has been given of use of the dispensing valve with container holding water, other fluids may of course be dispensed such as granules.

[066] It would also be possible to include an indexing system to the dispensing valve so that the rotation of the moveable part relative to the fixed part may be determined more effectively. Such a system could be achieved by means of interacting and radially opposing projections located on the fixed part and the moveable part. These projections could also be designed to produce a click, which may be both felt and heard by the user as the moveable part is rotated relative to the fixed part. In the same manner, the dispensing valve could be designed so that a click may be heard and felt by the user when the dispensing valve is correctly and fully opened or closed to provide a positive identification.

## Claims

- [001] A valve for use as a fluid flow regulator, comprising
- an outer part (10,210, 410) having at least one orifice (16)
  - an inner part (20, 220, 420), and
  - at least one sealing olive (40) extending around the circumference of the valve, wherein
    - one of the inner and outer parts is adapted for fluid communication with a source of fluid,
    - one of the inner and outer parts is fixed and the other is moveable relative to the fixed part, and
    - the moveable part is arranged to move between a closed position, in which fluid is prevented from reaching the orifice (16) and an open position, in which fluid may be dispensed from the orifice (16) characterised in that
      - the moveable part is free to rotate about its axis, but axial movement is prevented, and
      - in the closed position, the inner part (20, 220, 420) and the outer part (10, 210, 410) are arranged relative to the or each sealing olive (40) to prevent fluid from flowing axially over the sealing olive (40) and through the orifice (16).

have at least one sealing olive (40) and

- said olives (40) are arranged to be substantially coincident, when the inner and outer parts are in the closed position.

[008] A valve according to any preceding claim, wherein a sealing olive (40) is provided axially either side of the at least one orifice (16).

[009] A valve according to any preceding claim, wherein the outer part (10, 210, 410) defines at least two fluid pathways, one via orifice (16) for dispensing fluid and one defining a venting gap (49).

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Fig.1.

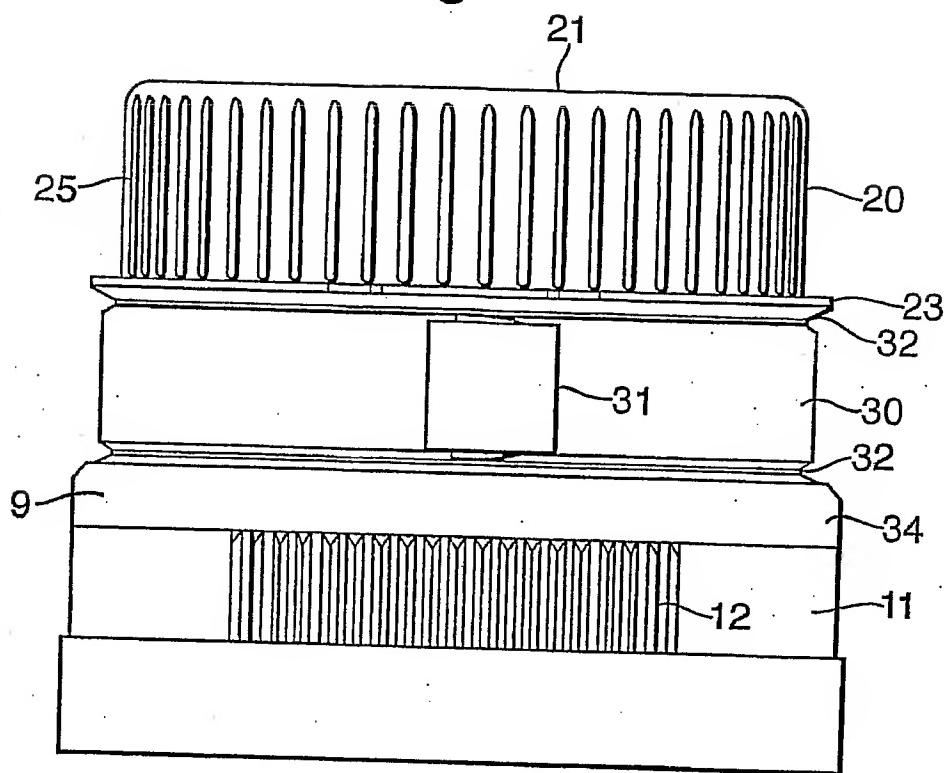
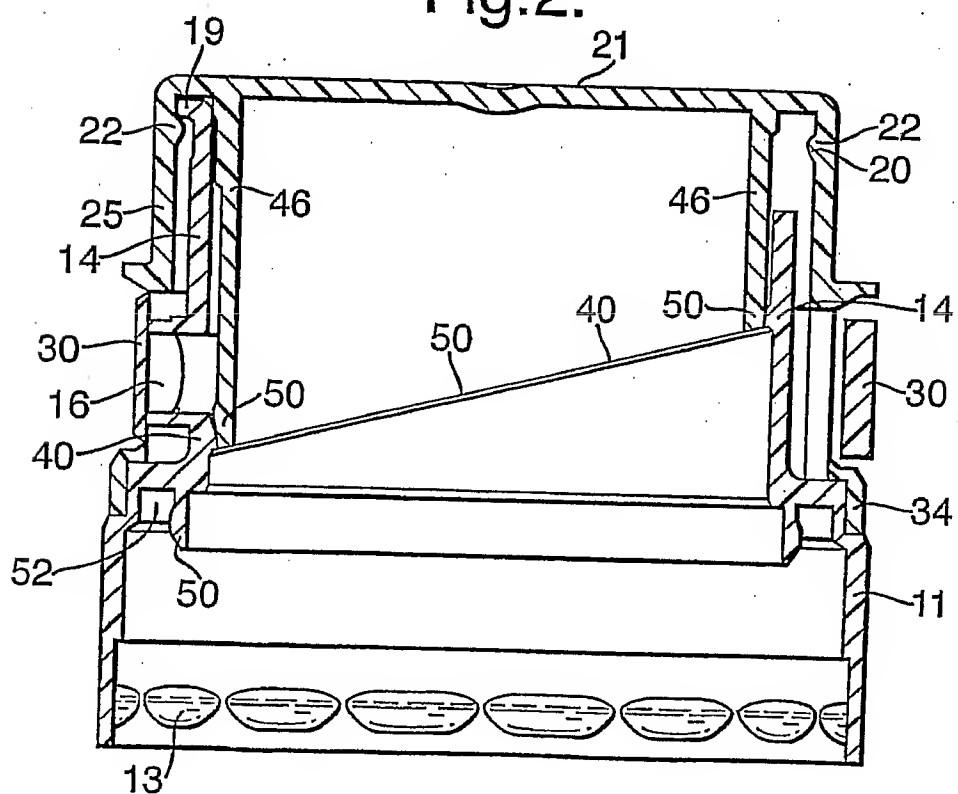


Fig.2.



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Fig.3.

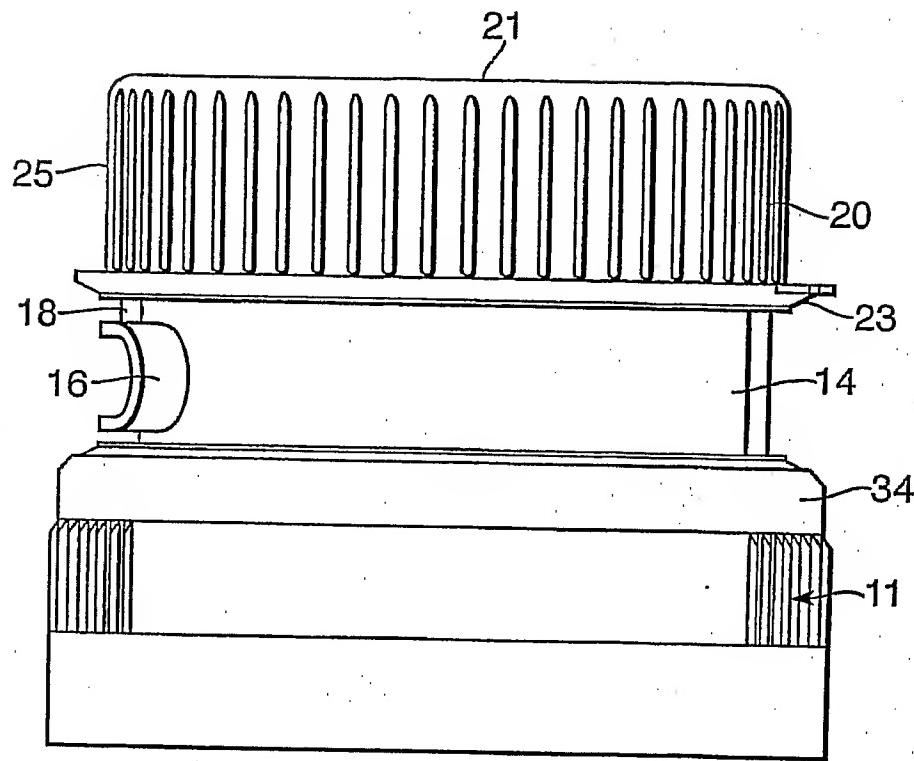
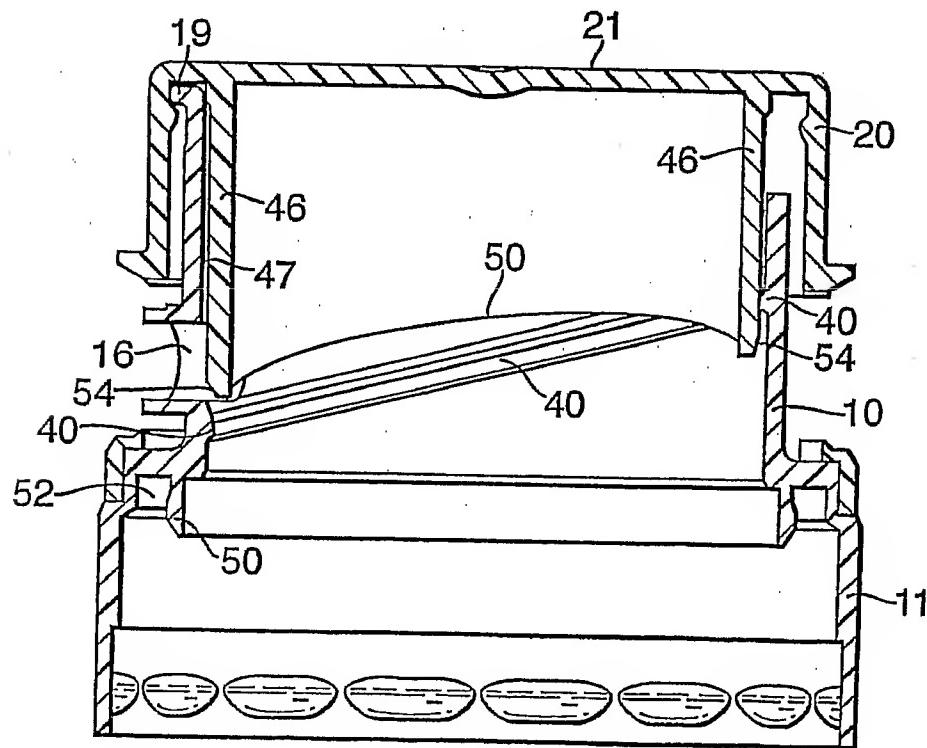
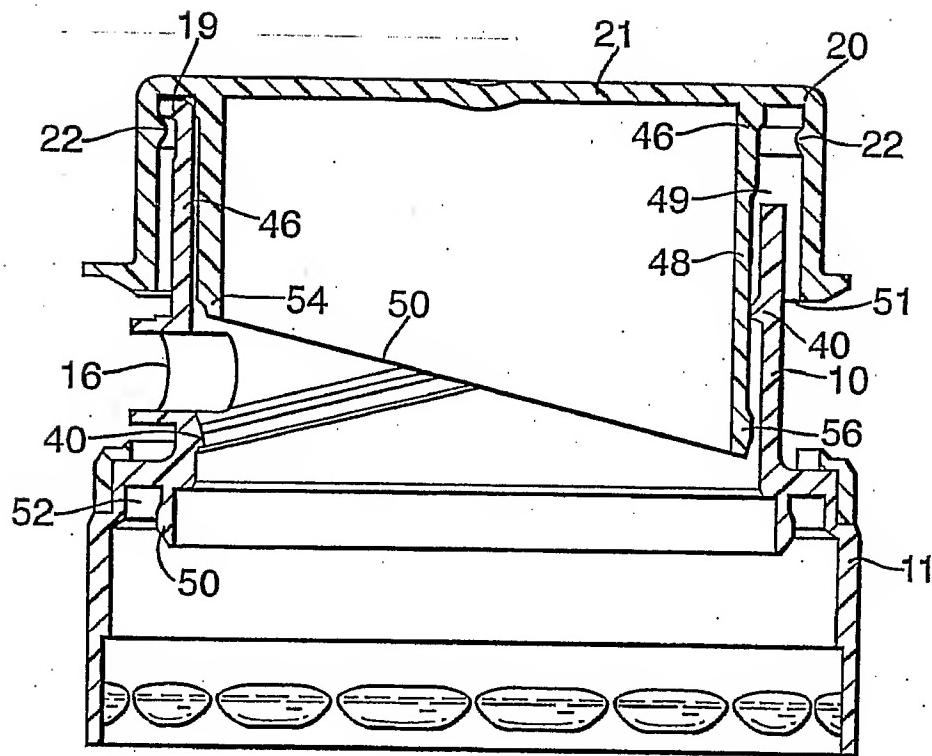


Fig.4.



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Fig.5.



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Fig.6.

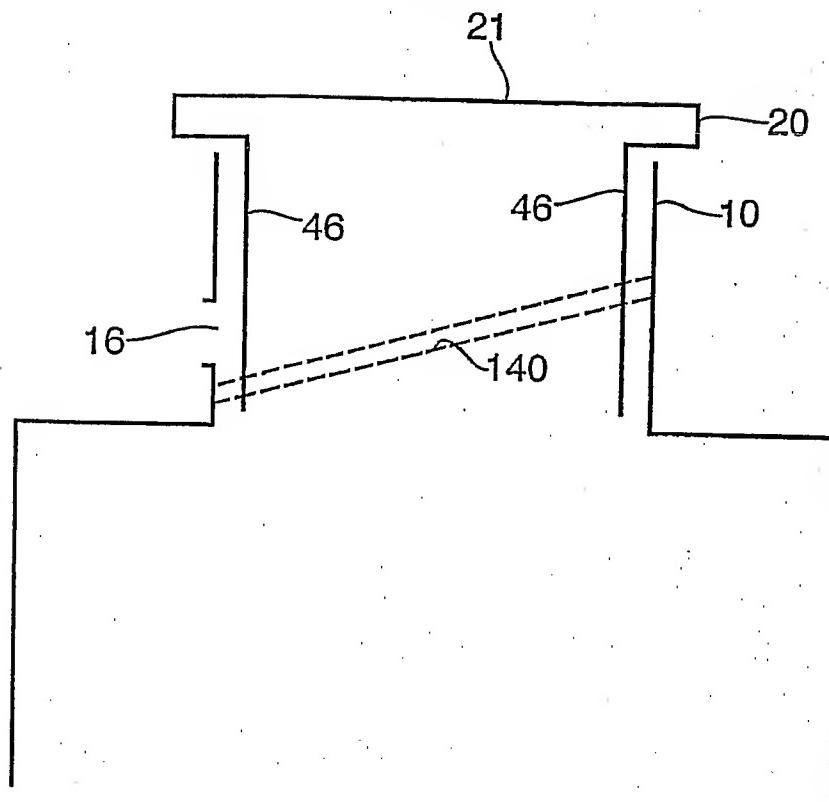


Fig.7.

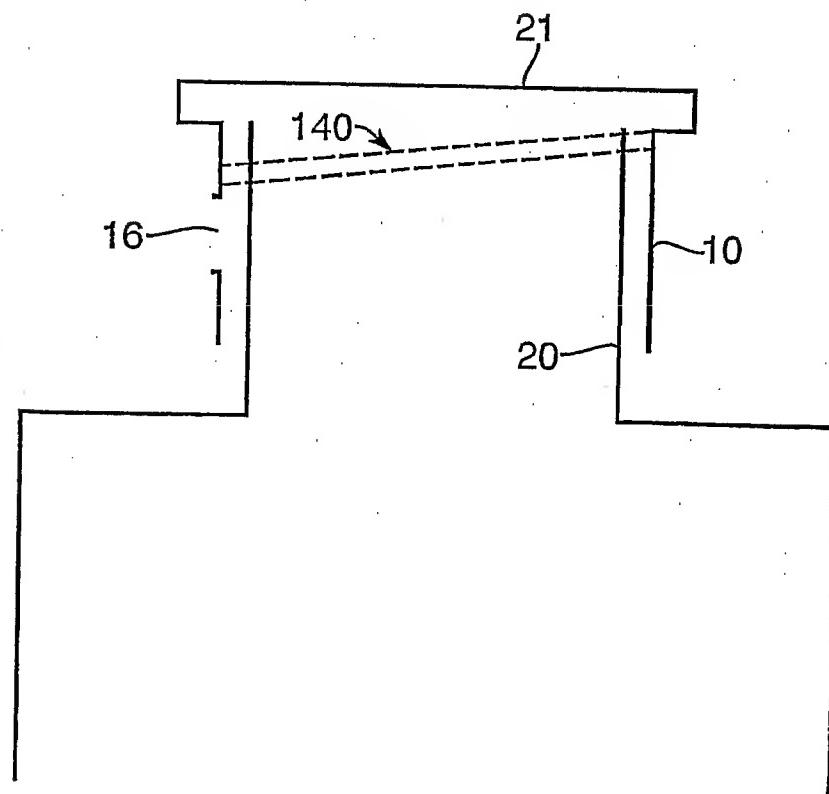


Fig.8.

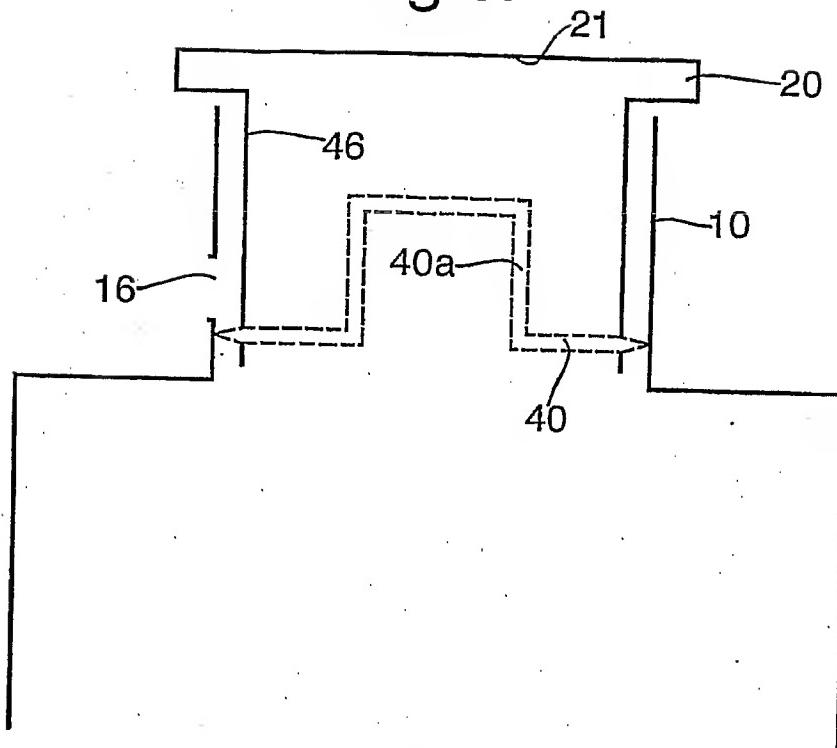
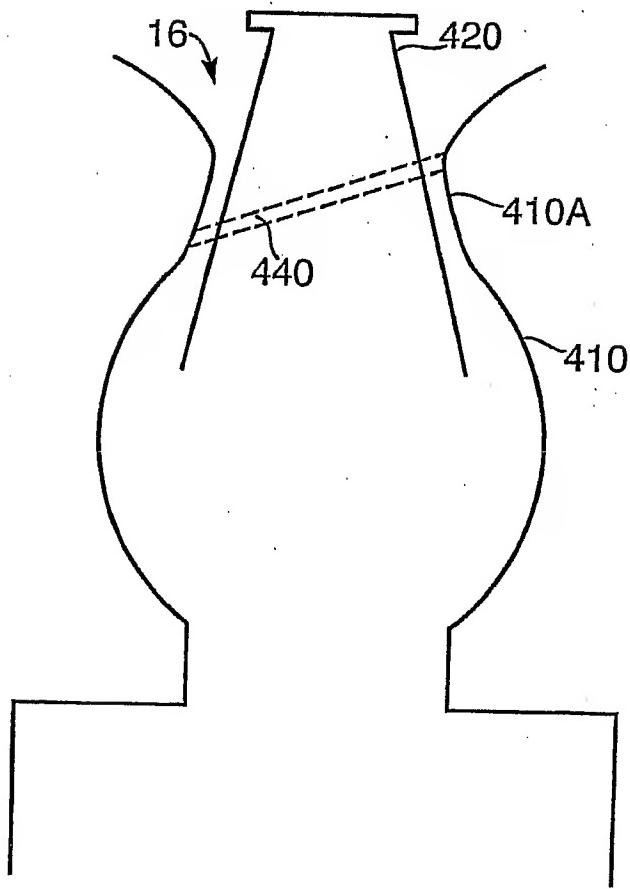


Fig.11.



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Fig.9.

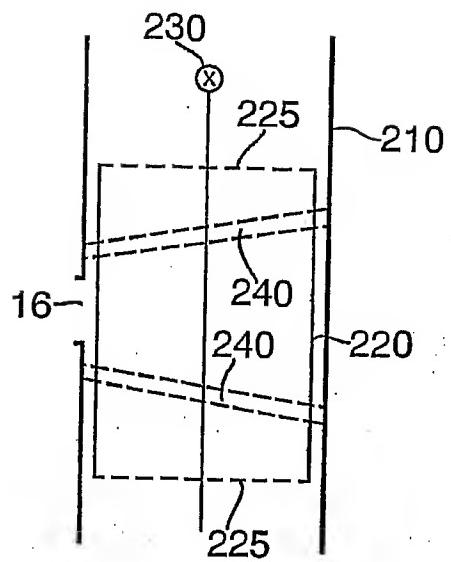


Fig.10.

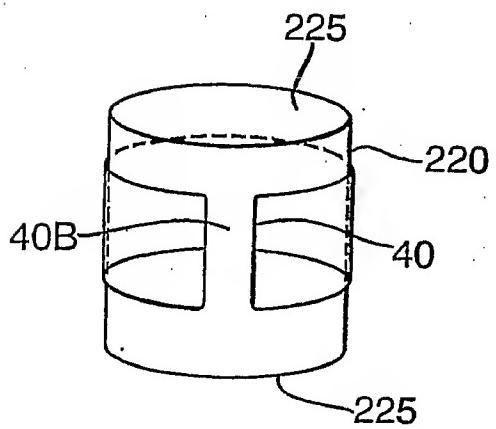


Fig. 1.

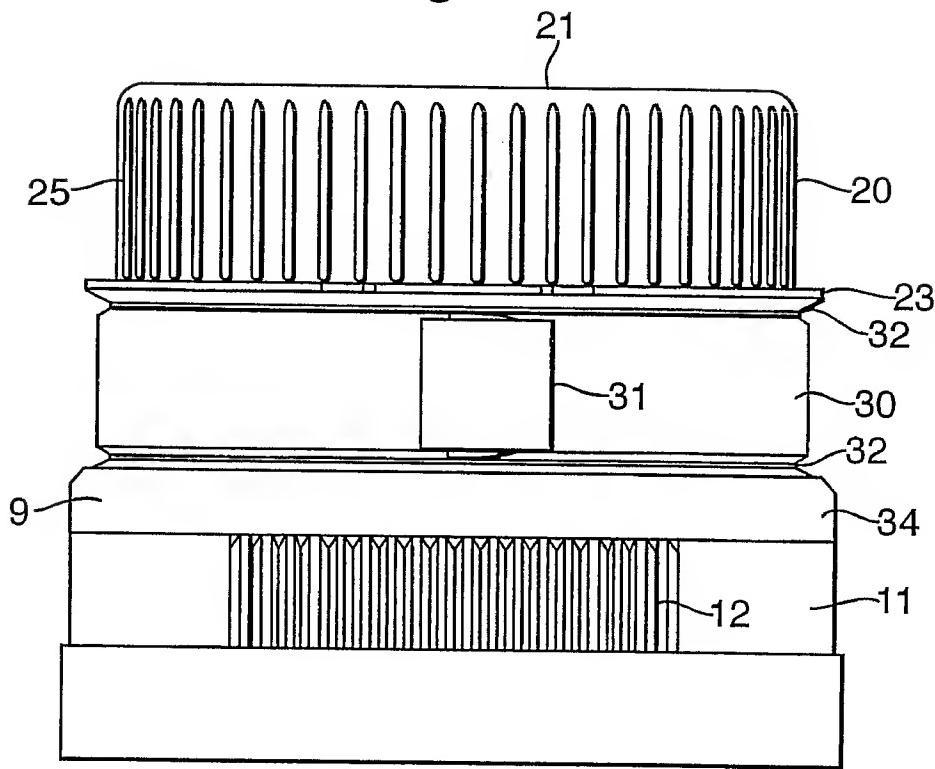


Fig. 2.

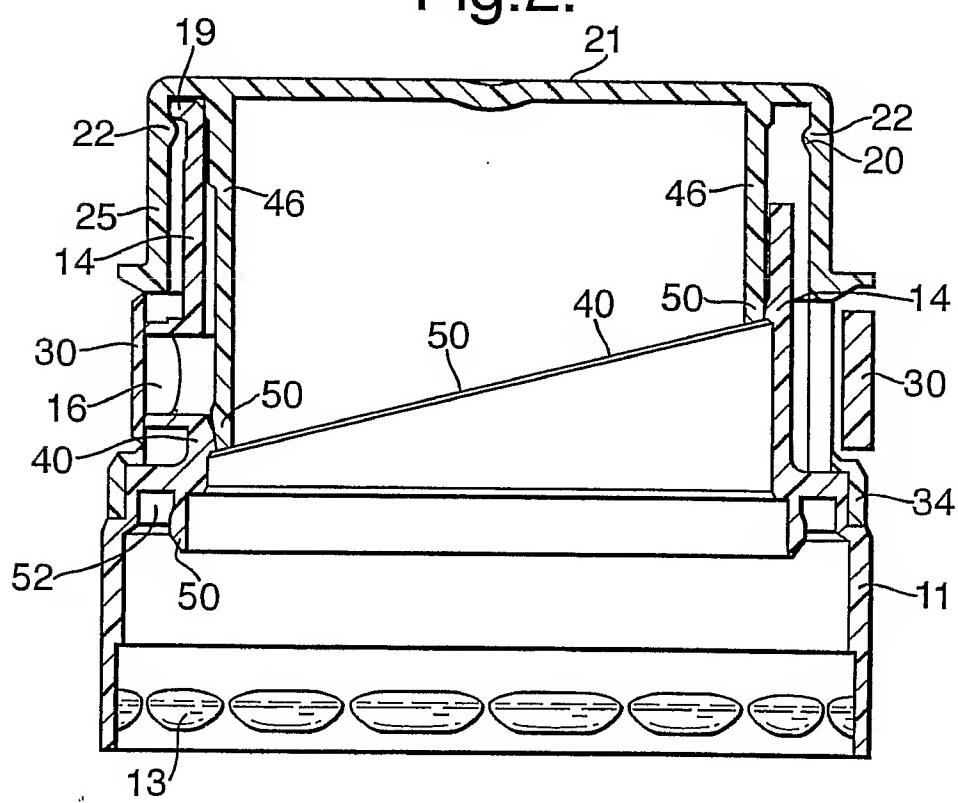


Fig.3.

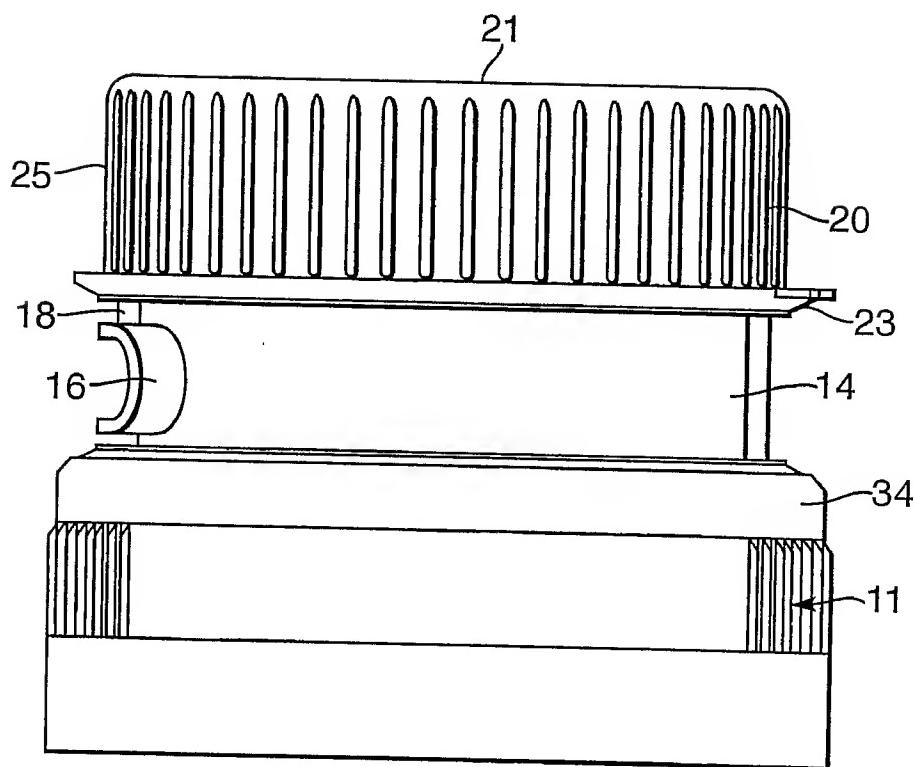


Fig.4.

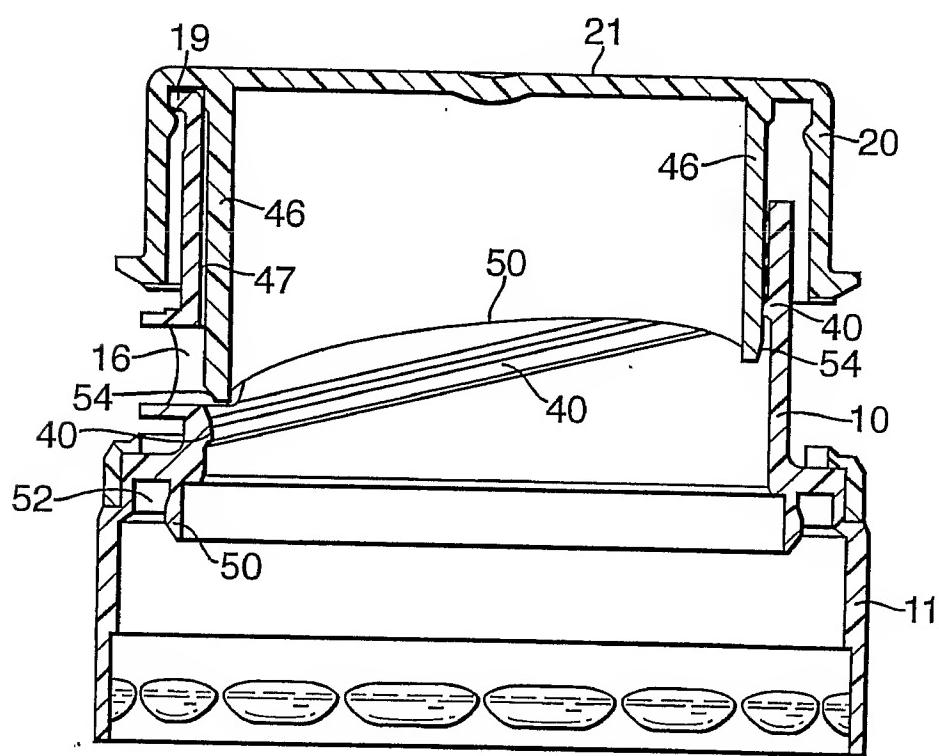


Fig.5.

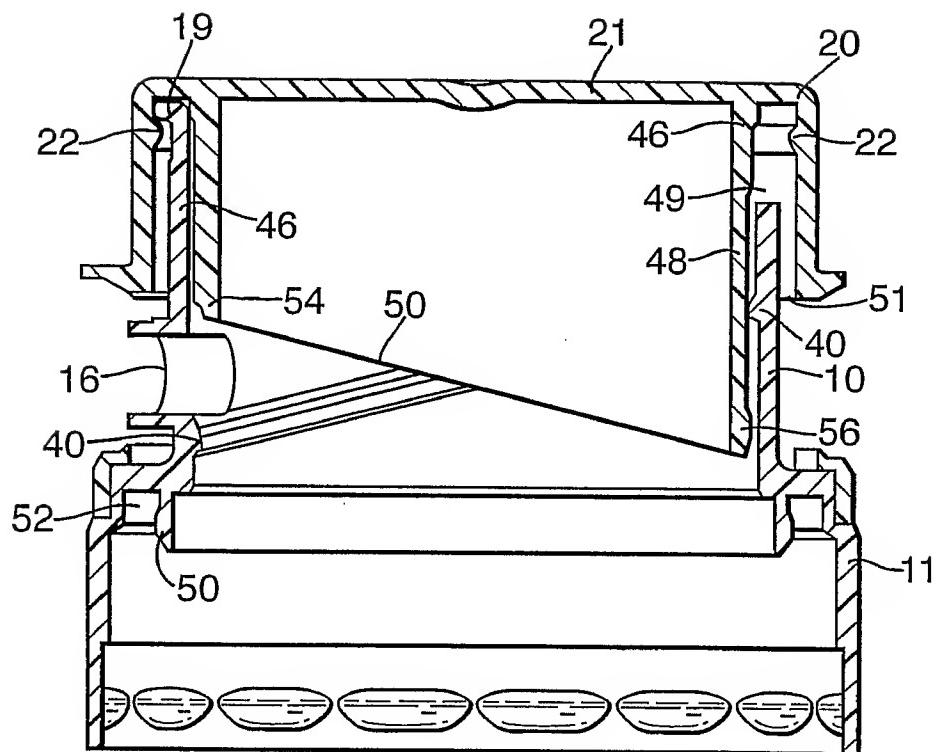


Fig.6.

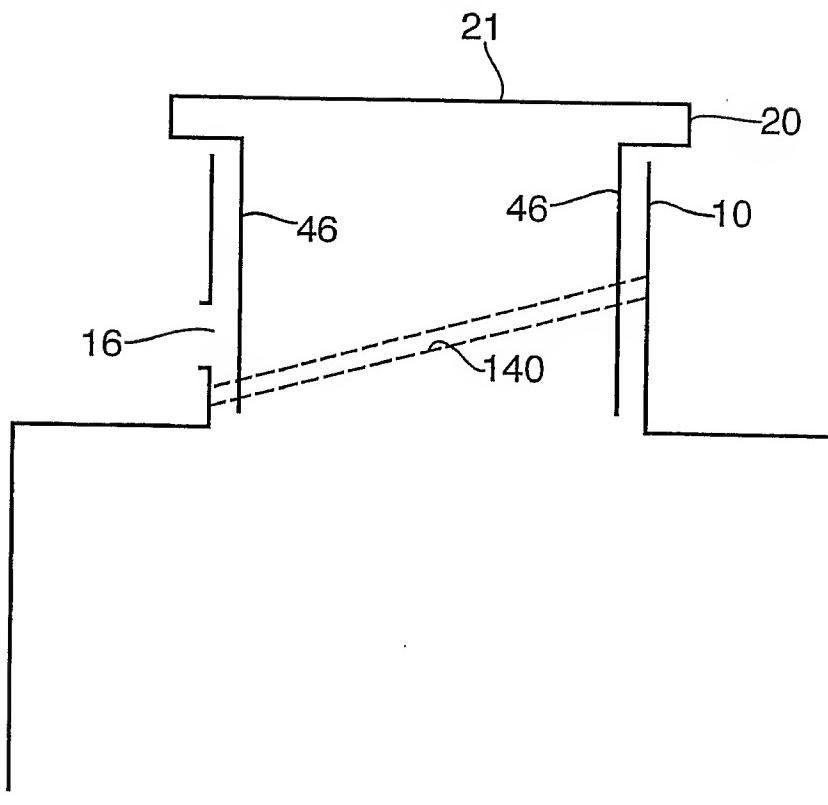


Fig.7.

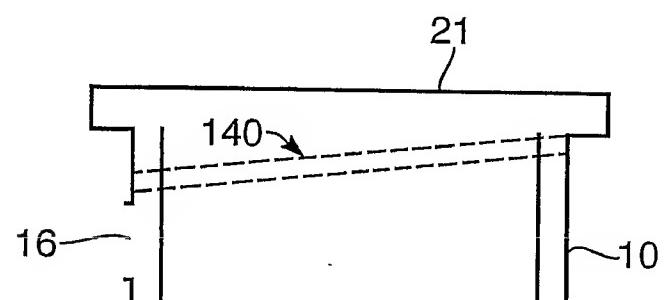


Fig.8.

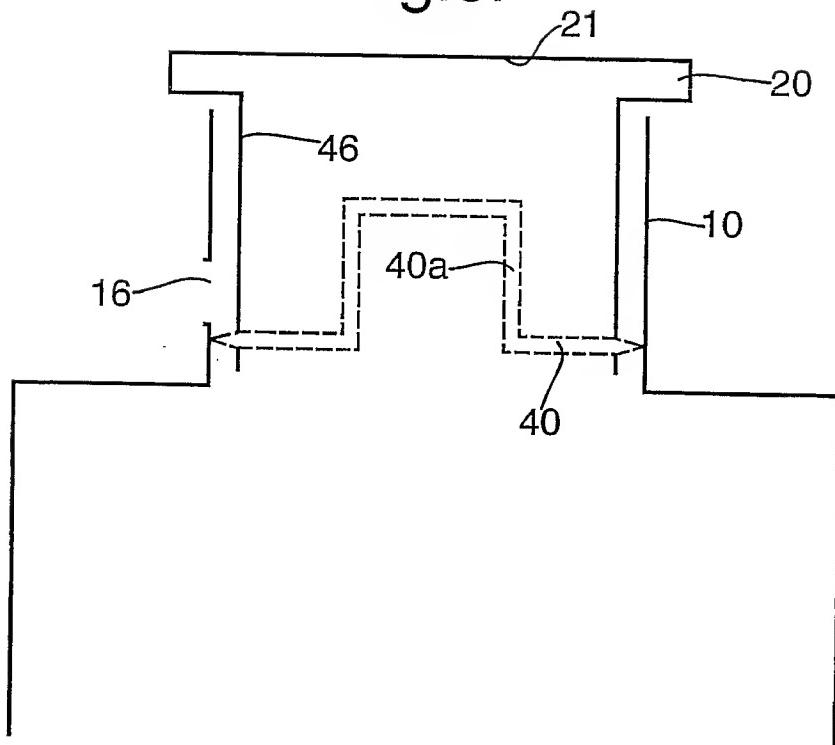


Fig.11.

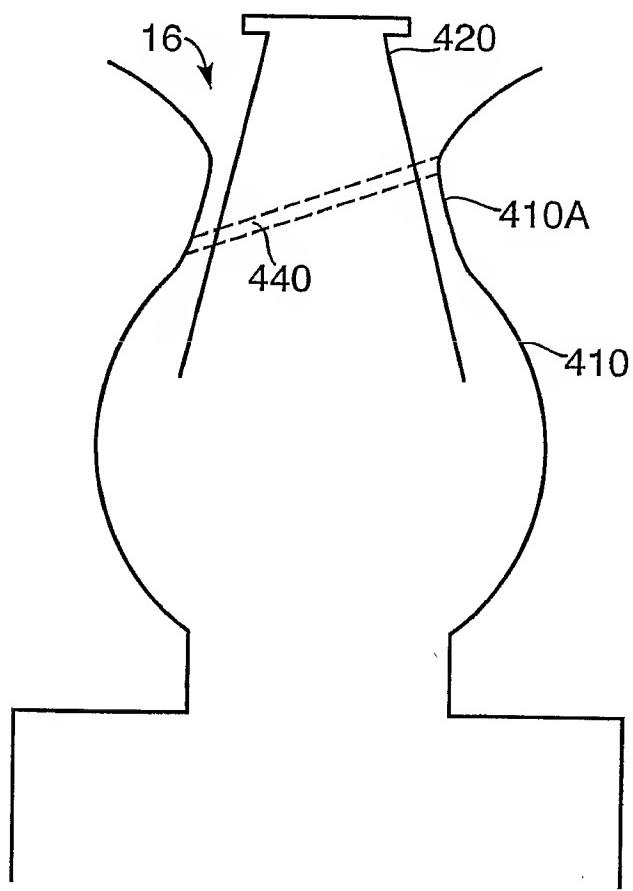


Fig.9.

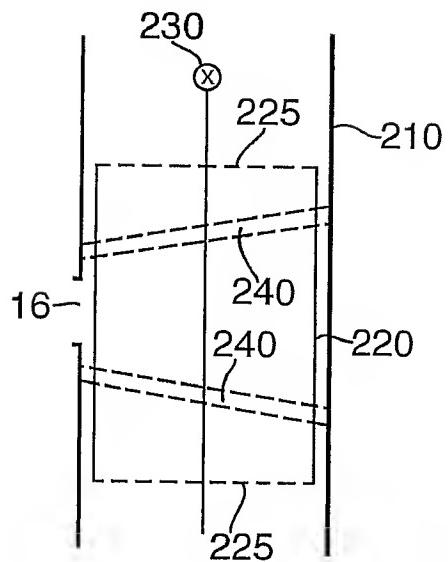
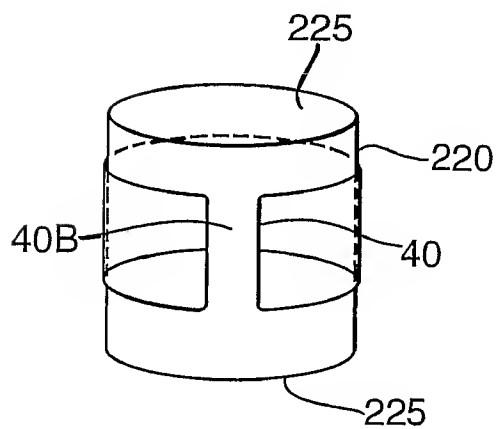


Fig.10.



## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP2005/053441

**A. CLASSIFICATION OF SUBJECT MATTER**  
B65D47/26 B65D47/32

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**Minimum documentation searched (classification system followed by classification symbols)  
B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
X	US 2004/026420 A1 (SMITH ERNEST L) 12 February 2004 (2004-02-12) paragraph '0021! - paragraph '0027!; figure 1	1-8
Y	EP 1 283 175 A (BERICAP) 12 February 2003 (2003-02-12) paragraphs '0044!, '0073! - '0075!; figures 5,10	9
Y	DE 861 666 C (ERICH EBBINGHAUS; GERHARD BEYKEN) 5 January 1953 (1953-01-05) page 2, line 76 - line 95; figure 1	9
A	US 2 858 054 A (HARKRADER STUARD K) 28 October 1958 (1958-10-28) column 2, line 15 - line 60; figures 1,2	1-8
A		1-8
		-/-

 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

## • Special categories of cited documents

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the international filing date
- \*L\* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the international filing date but later than the priority date claimed

\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

\*8\* document member of the same patent family

Date of the actual completion of the international search

Date of mailing of the international search report

15 November 2005

01.12.2005

Name and mailing address of the ISA

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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP2005/053441

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR 2 567 106 A (LAUBE WERNER) 10 January 1986 (1986-01-10) page 5, line 15 - line 27; figure 1 -----	1-8

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/EP2005/053441

### Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.: because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
  
3.  Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

### Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1.  As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
  
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
  
3.  As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

#### Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-8

A valve having a specific sealing structure for sealing the valve

2. claim: 9

A valve having venting means for allowing an easier emptying of the container.

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP2005/053441

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
US 2004026420	A1	12-02-2004	NONE		
EP 1283175	A	12-02-2003	AT 268297 T CN 1556766 A DE 60200577 D1 ES 2220883 T3 FR 2828174 A1 WO 03011702 A1 US 2005127102 A1		15-06-2004 22-12-2004 08-07-2004 16-12-2004 07-02-2003 13-02-2003 16-06-2005
DE 861666	C	05-01-1953	NONE		
US 2858054	A	28-10-1958	NONE		
FR 2567106	A	10-01-1986	DE 3424940 A1		06-02-1986



(11) EP 1 694 576 B1

✓

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VERSCHLUSS MIT ORIGINALITÄTSSICHERUNG

UNE FERMETURE INVOLABLE

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(56) References cited:  
**EP-A- 0 127 943**      **WO-A-02/096771**  
**DE-A- 3 605 963**      **US-A- 5 588 545**  
**US-A- 5 819 965**

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EP 1 694 576 B1

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

**Description**

[0001] The present invention relates generally to a closure for a container and particularly to a closure with means for indicating that the closure has been opened at least once.

[0002] There is an increasing demand for tamper-indicating systems which ensure that a container is not re-filled with non-original contents. Whilst it is relatively easy to produce some form of tamper-evidence, it is much more difficult to provide tamper-evidence which cannot be either overcome without causing the tamper-evidence system to activate, or activated and then returned to a visually identical state so as to appear non-activated.

[0003] A particularly useful method of providing tamper-evidence is to use a system in which a closure is initially located in a first position, but once removed can only be returned to a second position which is visually distinct from the first position. For example, US 5,738,231 describes a closure with a part which is moved during the opening process so that following opening it cannot pass back over a projection on the container finish. The result is that the closure can only return to a position in which it is axially displaced with respect to its original position.

Document WO-A-02/096771 describes a closure with a first portion with inner and outer parts, and a second portion. Initially a section of the inner part of the first portion protrudes below the level of the outer part and is held firmly by a region of the second portion which is formed so as to have a reduced circumference. When the first portion is removed the section of the inner part is pulled from under the area of reduced circumference on the second portion. After removal the inner part of the first portion and the area of reduced circumference on the second portion retain their original dimensions, so that if the first portion is reapplied the inner part can no longer pass under the area of reduced circumference. Accordingly a gap is produced between the outer part of the first portion and the second portion, because the section of the inner part which was previously trapped under the second portion is now trapped above the area of reduced circumference.

[0004] In both of the above prior art documents a gap is formed by trapping an obstructing member. The problem with such systems is that the obstruction member is easily accessible and could be removed, for example by cutting to defeat the tamper-evidence.

[0005] The present invention seeks to address the above problem.

[0006] The present invention provides a tamper-evident closure for a container, the closure comprising a first portion including inner and outer parts and a second portion, the outer part is movable relative to the inner part from a first position in which the outer part is immediately adjacent the second portion to a second position in which there is an unobstructed gap therebetween, the inner and outer parts are adapted to become irreversibly locked in

the second position so that the outer part cannot be moved back to the first position to close the gap.

[0007] The present invention therefore does not rely on an obstructing member becoming trapped to form a gap therebetween. By forming an unobstructed gap it is not possible to defeat the tamper-evidence by a simple cutting operation.

[0008] The second portion may be connected to a container and the first portion may comprise a cap. Certain industries demand closures with a first portion comprising a cap and a second portion comprising a sleeve which is connected to a container; for example the spirits industry.

[0009] The second portion may be permanently fixed 15 in its position on the container. This prevents the second portion from being moved upwardly to close the gap.

[0010] The first portion may be adapted to engage an in-bore fitment associated with the container. Certain industries, in particular the spirits industry, demand additional measures to prevent tampering. In-bore fitments such as non-return fitments are often fitted to containers to prevent re-filling regardless of other tamper-evidence measures.

[0011] The first portion may include a ratchet arrangement 25 for locking the inner and outer parts in the second position. A ratchet arrangement is a simple and efficient method of irreversibly locking the inner and outer parts together.

[0012] The first portion may include formations, such 30 as screw threads, for engaging the container or in-bore fitment as appropriate. In such cases the ratchet arrangement or other locking mechanism may be located above the formations so as to increase the difficulty in accessing and tampering with the locking arrangement.

[0013] The gap formed in the closure may be at the 35 respective adjacent peripheries of the portions. By forming the gap at the peripheries the gap is more visually obvious.

[0014] The inner part may include a part which extends 40 beyond the outer part towards the second portion in the second position. Whilst the part is in no way an obstruction member and is in no way required for formation of the unobstructed gap, the part is visible through the gap. The part could be, for example, a brightly coloured band to accentuate the presence of the gap.

[0015] The present invention also provides, in combination 45 a container and a tamper-evident closure, the closure comprising a first portion including inner and outer parts, and a second portion, the second portion is connected to the container and the first portion is the removable top cap, the first portion outer part is movable relative to the inner part from a first position in which the outer part is immediately adjacent to the second portion to a second position in which there is an empty, unobstructed

50 gap therebetween. Thereafter the first portion is removable and the inner and outer parts are adapted to become irreversibly locked in the second position so that the outer part cannot be moved back to the first position to close

the gap when the first portion is replaced.

[0016] The combination may further comprise an in-bore fitment connectable to the container, the first portion being adapted to engage the fitment.

[0017] The present invention will now be more particularly described, by way of example, with reference to the following drawings, in which:

Fig 1 is a section of a closure according to a first embodiment of the present invention, shown attached to a container and being in a first position;  
 Fig 2 shows the closure of Fig 1 in a second position prior to removal from the container;  
 Fig 3 shows a diagrammatic section along line III-III of Fig 2 illustrating a ratchet arrangement for locking the closure in the second position;  
 Fig 4 shows the closure of Fig 3 following removal from the container;  
 Fig 5 shows the closure of Fig 4 following reattachment to the container following first opening;  
 Fig 6 is a section of a tamper-evident closure according to an alternative embodiment, shown forming part of a tamper-evident arrangement on a container neck and being in a first position;  
 Fig 7 is a perspective view of a shell forming part of the closure of Fig 6;  
 Fig 8 is a perspective view of a ratchet member forming part of the closure of Fig 6;  
 Fig 9 is a perspective view of a liner part forming part of the closure of Fig 6;  
 Fig 10 is a perspective view of a pouring part forming part of the non-return fitment of Fig 6;  
 Fig 11 is a perspective section of a basket part forming part of the non-return fitment of Fig 6;  
 Fig 12 is a perspective view of a float forming part of the non-return fitment of Fig 6;  
 Fig 13 is a perspective view of the neck finish of Fig 6; and  
 Fig 14 is section of the closure of Fig 6 with the closure shown in a second position.

Referring to Fig 1 there is shown a tamper-evident closure generally indicated 10 attached to a container generally indicated 20. The container 20 includes a neck portion 21 with external screw threads 22. At the lower end of the neck 21 is an annular retention ring 23, the purpose of which is described in more detail below.

The closure comprises a first portion 25 and a second portion 30. The first portion 25 includes inner 35 and outer 45 parts.

The inner part 35 comprises a disk-shape top plate 36 with a cylindrical skirt 37 depending from its periphery.

[0018] The outer surface of the skirt 37 has screw threads 38 for engaging corresponding threads on the outer part 45.

[0019] The inner surface of the skirt 37 has screw

threads 39 for engaging corresponding threads 22 on the container 20.

[0020] Approximately half way along its length, the outer surface of the skirt 37 also includes two diametrically opposed wedge-shape ratchet members 40 (best shown in Fig 3).

[0021] The outer part 45 comprises a disk-shape top plate 46 with a cylindrical skirt 47 depending from its periphery.

[0022] The inner surface of the skirt 47 has screw threads 48 for engaging the threads 38 on the inner part 35.

[0023] At its open end, the inner surface of the skirt also includes two dimensionally opposed, wedge-shape ratchet members 49 (best shown in Fig 3).

[0024] The second portion 30 comprises an annular tamper-evident band and is connected to the open end of the outer part skirt 47 by frangible bridges 48. At the other end of the second portion 30, a plurality of flaps 31

project radially inwardly and upwardly. The flaps 31 are positioned to engage beneath the annular retention ring 23 on the container 20.

[0025] The operation of the closure will now be described with reference to Figs 2 to 5.

[0026] In order to open the closure 10 the outer part 45 is grasped and turned. The tightness of fit between the inner part 35 and the neck portion 21 is designed to be greater than that between the inner part 35 and the outer part 45, which means that there is greater friction.

[0027] Accordingly when the outer part 45 is initially turned it is the outer part 45 which moves axially upwards relative to the inner part 35; the inner part remains stationary.

[0028] Continued turning of the outer part 45 eventually leads to the ratchet members 40, 49 passing each other and locking in the position shown in Figs 2 and 3. The outer and inner parts 45, 35 are now irreversibly locked in this second position. It will be seen that there now exists a gap (G) between the open end of the outer part skirt 47 and the second portion 30. The gap (G) is empty and unobstructed; that is, the gap (G) is not created by an obstruction structure which braces between the skirt 47 and the second portion 30.

[0029] With the outer 45 and inner 35 parts locked together as shown in Figs 2, continued turning of the outer part 45 now acts to unscrew the inner part 35 from the container neck 21. In Fig 4 the closure 10 is shown removed completely from the container neck 21 to allow access to the container 20.

[0030] When the closure 10 is replaced on the container neck 21 it cannot be returned to its first position because the inner and outer parts 35, 45 are still locked together. Instead the closure can only be returned to the position shown in Fig 5, in which the gap (G) remains.

[0031] In this embodiment it will be noted that the length of the inner part skirt 37 is such that it protrudes below the level of the outer part skirt 47 in the second position. As a result, the skirt 37 can be seen through the gap (G). The skirt 37 could, for example, be brightly coloured or include a message in the area visible through the gap (G) to accentuate the fact that the gap (G) is there and warn of potential tampering.

[0032] Figs 6 to 13 show an alternative embodiment of the present invention. In this embodiment the closure 110 forms part of a tamper-evident arrangement for a container 120 having a neck 121 with an associated in-bore non-return fitment generally indicated 100.

[0033] Referring generally to Fig 6, the components of the tamper-evident arrangement are as follows: the closure 110 comprises a shell 155, a ratchet part 160 and a liner part 165; the non-return fitment 100 comprises a pouring part 175, a ball 200, a floatvalve 186 and a basket part 190.

[0034] The components of the tamper-evident arrangement will now be described in more detail.

[0035] The closure shell 155 is shown in Fig 7 and is a metal closure of the well-known "roll-on pilfer-proof" type. The shell comprises a disk-shape top plate 156 with a side wall 157 depending from its periphery. The shell 155 includes upper 155a and lower 155b sections. The shape of the side wall 157 is determined at least in part after the shell is applied because a series of rollers and cutters are used to form a frangible line 159 and first 158a and second 158b rolled-in regions, as is described in more detail below.

[0036] The ratchet part 160 is shown in Fig 8 and comprises a tubular body part. The inner surface of the part 160 includes screw threads 161. The inner surface also includes a ratchet member 162 for engaging a corresponding notch in the liner part 165. The inner surface also includes a ratchet step 163 formed by a band of thicker material at the opposite end of the part 160 to the ratchet member 162. The outer surface includes an annular groove 164 which is used to hold the part 160 in the shell 155 by virtue of a first crimped-in region 158 of the shell 155 (see Fig 6).

[0037] The liner part 165 is shown in Fig 9 and comprises a disk-shape top plate 166 with a cylindrical skirt 167 depending from its periphery. The upper part 167a of the surface of the skirt 167 includes screw threads 168 for engaging the threads 161 of the ratchet part. The inner surface of the skirt 167 includes screw threads 169 (shown in phantom on Fig 9) for engaging corresponding threads on the pouring part 175. Below the thread start of the external screw thread 168 is a notch 174 for receiving the ratchet member 162 of the ratchet part 160. Below the thread start of the internal screw thread 169 is a ratchet tooth 174a (see Fig 6) for engaging a corresponding tooth 180a on the outer surface of the pouring part 175 (see Fig 6).

[0038] The top plate 166 is surrounded by an annular upturned flap 170. The skirt 167 includes an annular ex-

tension portion 171 below an annular flange 172 at the lower end of the skirt 167.

[0039] As shown best in Fig 6, an annular plug band 173 depends from the inner surface of the top plate 166 and is adapted to engage in the pouring part 175.

[0040] The pouring part 175 is shown in Fig 10 and comprises a generally frusto-conical hollow body with an upper thread-bearing portion 176 having external screw threads 177 for engaging the internal screw threads 169 on the liner 165. Within the thread bearing portion 176 is positioned a dome-shape flow regulator 178. The regulator 178 is attached by three axial spokes 179 to the inner wall of the portion 176 to provide a flow path around the regulator 178.

[0041] A ball chamber 180 depends from the portion 176 and is sized to accommodate the ball 200 in such a way that it can move freely. The outer surface of the ball chamber 180 includes the ratchet tooth 180a for engaging the ratchet tooth 174a of the liner part 165,

[0042] A basket-retaining part 181 depends from the ball chamber 180. The internal bore of the basket-retaining part 181 is increased by a step 182 at the bottom of the ball chamber 180. The increased bore is sized to accommodate the basket 190 as described below.

[0043] A neck-engaging part 183 depends from the basket retaining part 181. The neck-engaging part 183 begins with an external annular groove 184a which is used to help hold the fitment 175 on the container neck 121 by virtue of the second rolled-in region 158b of the shell (see Fig 6).

[0044] Below the groove 184a, the internal surface of the part 183 includes a plurality of axial ribs 185 for engaging ribs 125 on the container neck 121, as described below. The ribs 185 are visible in Fig 10 through a window

186 in the basket-retaining part. An identical window is present diametrically opposite (not shown). The windows 186 are present so that a sharp retention edge 184c can be formed in a moulding production process. The edge 184c provides a very strong connection under the lip 123 of the container neck 121.

[0045] Opposite the external groove 184a is an internal step 184b.

[0046] The basket part 190 is shown in Fig 11 and includes an annular upper part 191 sized so that it has an interference sealing fit within the basket-retaining part 181 of the pouring part 175. The seal is improved with the presence of a bead 192 approximately half way along the outer surface of the part 191. The internal diameter of the part 190 decreases at the lower end of the upper

part 191 with a curved step 193 and continues to form an annular plug part 194 sized to fit sealingly into the internal bore of the container neck 121. Approximately half way along the external surface of the plug part 194 is a bead 195 for improving the seal against the container neck 121.

[0047] At the intersection of the step 193 and the plug part 192 a valve seat comprising a circular groove 194 extends radially inwardly and connects to a non-return

valve comprising an upstanding hoop 195 with the three internal spokes 196 forming three generally triangular orifices 197. At the bottom of the annular upper part 191 an inwardly curved sealing member 198 depends. The sealing member 198 can flex upwardly towards the underside of the step 193 and is positioned to seal against the upper surface 122 of the container neck.

[0048] Also at the bottom of the annular upper part 191 a circumferential flange 199 extends radially outwards.

[0049] The float valve 186 is shown in Fig 12 and comprises a disk-shape top plate 187 with a cylindrical skirt 188 depending from its periphery. The skirt 188 is sized so that its open end fits into the groove 194 of the basket part 190.

[0050] The neck finish 121 is shown in Fig 13 and comprises an upper lip 123 below which is a lower portion 124 of reduced diameter. The lower portion has a plurality of spaced axial ribs 125 around its periphery. A shoulder emerges from the lower end of the lower portion 124.

[0051] The tamper-evident arrangement shown in Fig 6 is assembled as follows.

[0052] The ball 200 is placed in the ball chamber 182. The float 186 is placed on the basket 190 and sits in the groove 194. The upper part 191 of the basket is pushed into the basket-retaining part 181 of the pouring part 175; the insertion extent is limited by the step 182. The liner part 165 is screwed onto the pouring part 175 using the corresponding screw threads 169, 177. The plug part 173 enters the inner bore of the thread bearing portion 176. The ratchet part 160 is connected to the pouring part by opening the tubular body part at the split line 160a. The part 160 is then fitted around the upper part 167a of the pouring part before allowing the part 160 to close with the threads 161, 168 now engaged and the lower edge of the ratchet resting on the liner flange 172.

[0053] The ratchet part 160, liner part 165, pouring part 175, ball 200, float valve 186 and basket part 190 are then added to the container neck 121 by pressing the neck-engaging part 183 of the pouring part 175 over the lip 123. The plug part 192 of the basket 190 enters the inner bore of the container neck 121 until the sealing member 198 contacts the upper surface 122 of the container neck 121 and the step 184b clips under the lip 123. At this point the ribs 125, 185 on the neck 121 and pouring part 175 engage to prevent relative rotation.

[0054] The shell 155 is now added. The shell side wall 157b is initially straight. Following placement over the rest of the tamper-evident arrangement the side wall is crimped into the groove 164 of the ratchet part and the groove 184 of the pouring part at points 158a and 158b respectively.

[0055] A frangible line 159 is created approximately half way down the side wall 157 by slitting to leave thin bridges (not shown).

[0056] The operation of the closure is as follows.

[0057] Initially the upper section 155a of the shell 155 is grasped above the frangible line 159 and twisted. The pouring part 175 cannot turn by virtue of the ribs 125,

185 on the container neck 121 and the neck-engaging part 183. The lower section 155b of the section of shell below the frangible line is firmly connected to the pouring part by crimped-in region 158b, and also cannot turn.

5 5 The liner part 165 is prevented from turning relative to the pouring part 175 at this stage because of the interaction of the ratchet teeth 174a, 180a.

[0058] The upper section 155a of the shell turns and the frangible line 159 breaks. The turning of the upper section 155a turns the ratchet part 160 by virtue of the firm connection provided by the region 158a in the groove 164.

[0059] The ratchet part 160 continues to rise in the upper shell section 155a until the step 163 passes over

15 the flap 170 and the ratchet member 162 enters the notch 174 on the liner part 165. The flap 170 prevents the upper shell section 155a from moving back down by its engagement with the step 163 and the ratchet member 162 prevents relative rotation between the ratchet part 160 and the liner part 165. Because the step 163 and flap 170 are located above the respective screw threads, access to this part of the closure is made difficult. Re-setting of the ratchet arrangement is thereby made more difficult.

[0060] The tamper-evident arrangement is now shown 20 in the position shown in Fig 14. A gap (G1) is formed in the shell 155 between the upper 155a and lower 155b shell sections. The gap (G1) is unobstructed; there is no obstacle at the point of dislocation to prevent closing of the gap (G1). Continued turning of the upper shell section

25 30 35 the liner 165 with respect to the pouring part 175; again the pouring part 175 remains stationary. [0061] The action of twisting the liner part 165 off the pouring part 175 may break one or both of the ratchet teeth 174a, 180a, and may make a 'crack' sound to reinforce the tamper-proof nature of the closure. Therefore the interaction of the ratchet teeth 174a, 180a must be strong enough to counter the force of the ratchet part 160 turning relative to the liner part 165. In particular the interaction must be strong enough to remain intact as the ratchet part step 163 passes over the liner flap 170. However, the ratchet teeth 174a, 180a interaction is such that it can be overcome once the ratchet part 160 and liner part 165 are locked in place. Other types of semi-permanent locking arrangements could be used between the liner part 165 and the pouring part 175. For example the parts could be glued together. Preferably the locking arrangement is destroyed during the opening operation to prevent the tamper-evident arrangement from being reset.

40 45 50 [0062] The non-return fitment 100, of which the pouring part 175 forms part, will be well known to those skilled in the art and its operation will not be described in detail. [0063] The upper shell section 155a, the ratchet part 160 and the liner part 165 are then removed to expose the pouring part 175.

[0064] When the upper shell section 155a is replaced and the liner part 165 is screwed back onto the pouring part 175, the gap (G1) cannot be re-closed because the

ratchet part 160 prevents the upper shell section 155a moving down further than is shown in Fig 14. It will be noted that the annular extension portion 171 of the liner 165 is visible through gap (G1) in the position shown in Fig 14.

[0065] The upper shell section 155a constitutes the first portion outer part of the closure. The liner 165 constitutes the first portion inner part. The lower shell section 155b constitutes the second portion. The ratchet part 160 locks the inner and outer parts together.

### Claims

1. A tamper-evident closure (10) for a container (20), the closure comprising:

- a first portion (25) including inner (35) and outer (45) parts, and
- a second portion (30), characterized in that

the outer part (45) is movable relative to the inner part (35) from a first position in which the outer part (45) is immediately adjacent the second portion (30) to a second position in which there is an unobstructed gap (G) therebetween, the inner (35) and outer (45) parts are adapted to become irreversibly locked in the second position so that the outer part (45) cannot be moved back to the first position to close the gap (G).

2. A closure (10) according to claim 1, wherein the second portion (30) is adapted to be connected to a container (20) and the first portion (25) comprises a cap.

3. A closure (10) according to claim 2, wherein the second portion (30) is permanently fixed in its position on the container.

4. A closure (110) according to any of claims 1 to 3, wherein the first portion (155a, 165) is adapted to engage an in-bore fitment (100) associated with the container.

5. A closure (10) according to any preceding claim, wherein the first portion (25) includes a ratchet arrangement (40, 49) for locking the inner (35) and outer parts (45) in the second position.

6. A closure (110) according to claim 5, wherein the first portion (155a, 165) includes engagement formations (169) and the ratchet arrangement (163, 170) is located above the formations (169).

7. A closure (10) according to any preceding claim, wherein the gap (G) is formed at the respective adjacent peripheries of the portions (25, 30).

8. A closure (110) according to any preceding claim, wherein the inner part (165) includes a part (171) which extends beyond the outer part (155a) towards the second portion (155b) in the second position, the part (171) is positioned so as to be visible through the gap (G1).

9. In combination a container (20) and a tamper-evident closure (10), the closure (10) comprising:

- a first portion (25) including inner (35) and outer (45) parts, and
- a second portion (30), characterized in that

the second portion (30) is connected to the container (20) and the first portion (25) is a removable top cap, the first portion outer part (45) is movable relative to the inner part (35) from a first position in which the outer part (45) is immediately adjacent the second portion (30) to a second position in which there is an empty, unobstructed gap (G) therebetween, thereafter the first portion (25) is removable and the inner (35) and outer (45) parts are adapted to become irreversibly locked in the second position so that the outer part (45) cannot be moved back to the first position to close the gap (G) when the first portion (25) is replaced.

10. A combination according to claim 9, wherein the combination further comprises an in-bore fitment (100) connectable to the container (120), the first portion (155a, 165) being adapted to engage the fitment (100).

### Patentansprüche

1. Sicherheitsverschluss (10) für einen Behälter (20), wobei der Verschluss besteht aus:

- einem ersten Teilbereich (25) einschließlich einem inneren (35) und einem äußeren (45) Teil und
- einem zweiten Teilbereich (30),

dadurch gekennzeichnet, dass  
der äußere Teil (45) in Bezug auf den inneren Teil (35) aus einer ersten Position, in welcher der äußere Teil (45) unmittelbar am zweiten Teilbereich (30) anliegt, in eine zweite Position bewegbar ist, wobei sich dazwischen eine ungehinderte Lücke (G) befindet und wobei der innere (35) und der äußere Teil (45) so ausgeführt sind, dass sie irreversibel in der zweiten Position gesperrt sind, sodass der äußere Teil (45) nicht in die erste Position zurückbewegt werden kann, um die Lücke (G) zu schließen.

2. Verschluss (10) gemäß Anspruch 1, dadurch ge-

- kennzeichnet, dass** der zweite Teilbereich (30) so ausgeführt ist, dass er mit einem Behälter (20) verbunden ist und **dass** der erste Teilbereich (25) einen Deckel aufweist.
3. Verschluss (10) gemäß Anspruch 2, **dadurch gekennzeichnet, dass** der zweite Teilbereich (30) in seiner Position permanent am Behälter befestigt ist.
4. Verschluss (110) gemäß einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** der erste Teilbereich (155a, 165) so ausgeführt ist, dass er in ein mit dem Behälter verbundenes eingehobenes Passeelement (100) eingreift.
5. Verschluss (10) gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der erste Teilbereich (25) eine Ratsche (40, 49) zum Sperren des inneren (350 und äußeren (45) Teils in der zweiten Position aufweist.
6. Verschluss (110) gemäß Anspruch 5, **dadurch gekennzeichnet, dass** der erste Teilbereich (155a, 165) Eingreifanordnungen (169) enthält und die Ratsche (163, 170) über den Anordnungen (169) angebracht ist.
7. Verschluss (10) gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Lücke (G) an den jeweils anliegenden Umfängen der Teilbereiche (25, 30) gebildet ist.
8. Verschluss (110) gemäß Anspruch einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der innere Teil (165) einen Teil (171) aufweist, der in der zweiten Position über den äußeren Teil (155a) zum zweiten Teilbereich hin weiterführt, wobei der Teil (171) so positioniert ist, dass er durch die Lücke (G1) hindurch sichtbar ist.
9. In Kombination einen Behälter (20) und einen Sicherheitsverschluss (10), wobei der Verschluss besteht aus:
- einem ersten Teilbereich (25) mit einem inneren (35) und einem äußeren Teil (45), und
  - einem zweiten Teilbereich (30), **dadurch gekennzeichnet, dass**
- der zweite Teilbereich (30) mit dem Behälter (20) verbunden ist und der erste Teilbereich (25) einen abnehmbaren Deckel aufweist, wobei der äußere Teil (45) des ersten Teilbereichs in Bezug auf den inneren Teil (35) von einer ersten Position, in welcher der äußere Teil (45) unmittelbar am zweiten Teilbereich (30) anliegt, in eine zweite Position bewegbar ist, wobei sich dazwischen eine irreversible Lücke (G) befindet, wonach der erste Teilbereich (25) abnehmbar ist und der innere Teil (35) und der äußere Teil (45) so ausgeführt sind, dass sie unlösbar in der zweiten Position gesperrt sind, sodass der äußere Teil (45) nicht in die erste Position zurückbewegt werden kann, um die Lücke (G) zu schließen, wenn der erste Teilbereich (25) ausgetauscht wird.
10. Kombination gemäß Anspruch 9, **dadurch gekennzeichnet, dass** die Kombination weiterhin aus einem an den Behälter (120) anschließbaren eingehobenen Passeelement (100) besteht, wobei der erste Teilbereich (155a, 165) so ausgeführt ist, dass er in das Passeelement (100) eingreift.
- 15 Revendications
1. Fermeture inviolable (10) pour un conteneur (20), la fermeture comprenant :
- une première partie (25) comprenant des parties intérieure (35) et extérieure (45), et
  - une deuxième partie (30), caractérisée en ce que
- 20 la partie extérieure (45) est mobile par rapport à la partie intérieure (35) à partir d'une première position dans laquelle la partie extérieure (45) est immédiatement adjacente à la deuxième partie (30) vers une deuxième position dans laquelle il y a un espace non obstrué (G) entre les deux, les parties intérieure (35) et extérieure (45) étant adaptées pour devenir irréversiblement verrouillées dans la deuxième position de sorte que la partie extérieure (45) ne puisse pas revenir à la première position pour fermer l'espace (G).
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2. Fermeture (10) selon la revendication 1, dans laquelle la deuxième partie (30) est adaptée pour être reliée à un conteneur (20) et la première partie (25) comprend un bouchon.
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3. Fermeture (10) selon la revendication 2, dans laquelle la deuxième partie (30) est fixée de manière permanente dans sa position sur le conteneur.
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4. Fermeture (110) selon l'une quelconque des revendications 1 à 3, dans laquelle la première partie (155a, 165) est adaptée pour mettre en prise une douille d'alésage (100) associée au conteneur.
- 40
5. Fermeture (10) selon l'une quelconque des revendications précédentes, dans laquelle la première partie (25) comprend un agencement d'encliquetage (40, 49) pour verrouiller les parties intérieure (35) et extérieure (45) dans la deuxième position.
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6. Fermeture (110) selon la revendication 5, dans la-
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quelle la première partie (155a, 165) comprend des formations de mise en prise (169) et l'agencement d'encliquetage (163, 170) est situé au-dessus des formations (169).

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7. Fermeture (10) selon l'une quelconque des revendications précédentes, dans laquelle l'espace (G) est formé aux périphéries adjacentes respectives des parties (25, 30).

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8. Fermeture (110) selon l'une quelconque des revendications précédentes, dans laquelle la partie intérieure (165) comprend une partie (171) qui s'étend au-delà de la partie extérieure (155a) vers la deuxième partie (155b) dans la deuxième position, la partie (171) étant positionnée afin d'être visible à travers l'espace (G1).

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9. Conteneur (20) et fermeture inviolable (10) en combinaison, la fermeture (10) comprenant :

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- une première partie (25) comprenant des parties intérieure (35) et extérieure (45), et
- une deuxième partie (30), caractérisée en ce que

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la deuxième partie (30) est reliée au conteneur (20) et la première partie (25) est un bouchon supérieur amovible, la partie extérieure (45) de la première partie est mobile par rapport à la partie intérieure (35) à partir d'une première position dans laquelle la partie extérieure (45) est immédiatement adjacente à la deuxième partie (30) vers une deuxième position dans laquelle il y a un espace vide, non obstrué (G) entre les deux, par la suite la première partie (25) est amovible et les parties intérieure (35) et extérieure (45) sont adaptées pour devenir irréversiblement verrouillées dans la deuxième position de sorte que la partie extérieure (45) ne puisse pas revenir à la première position pour fermer l'espace (G) quand la première partie (25) est remplacée.

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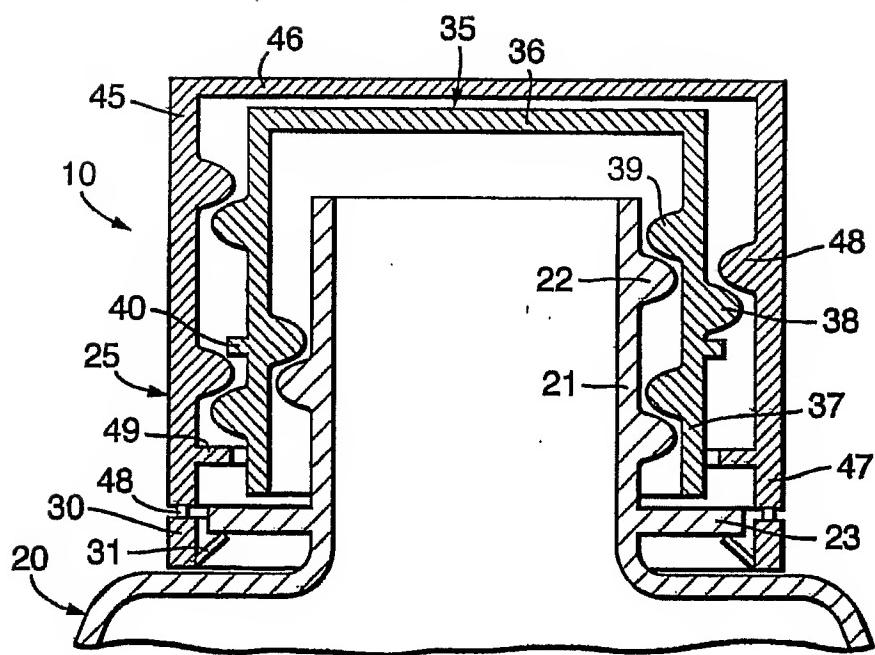
10. Combinaison selon la revendication 9, dans laquelle la combinaison comprend en outre une douille d'alésage (100) pouvant être reliée au conteneur (120), la première partie (155a, 165) étant adaptée pour mettre en prise la douille (100).

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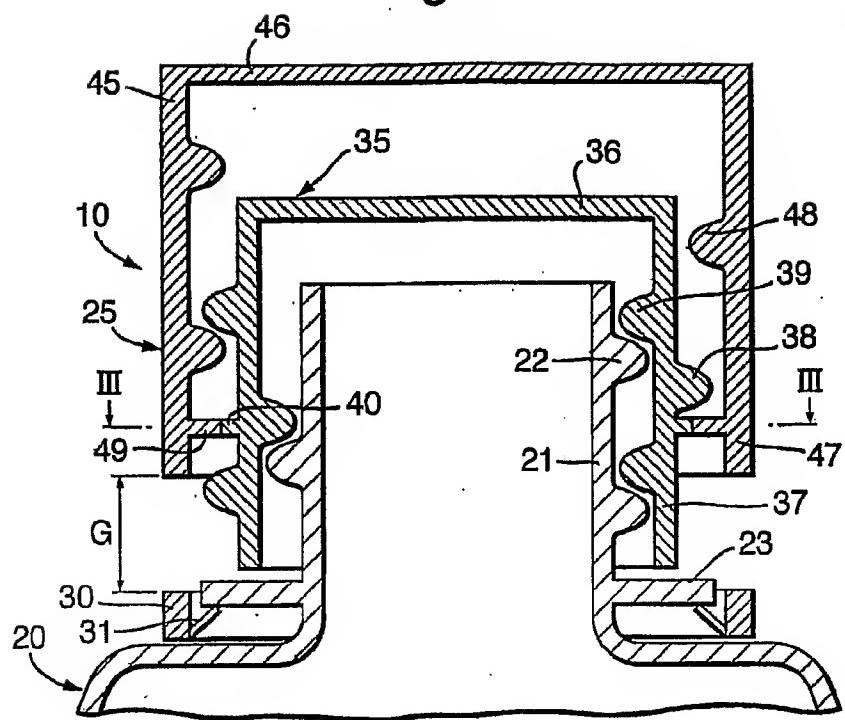
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Fig.1.



**Fig.2.**



**Fig.3.**

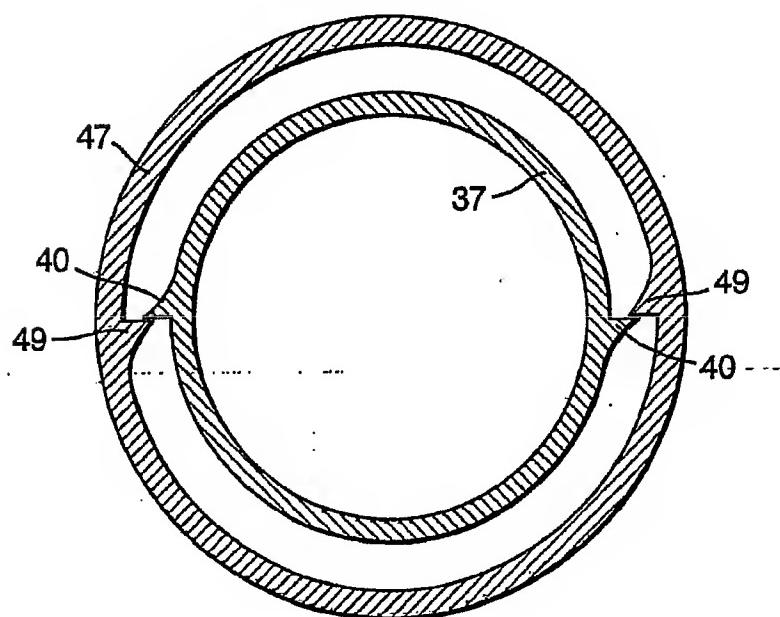


Fig.4.

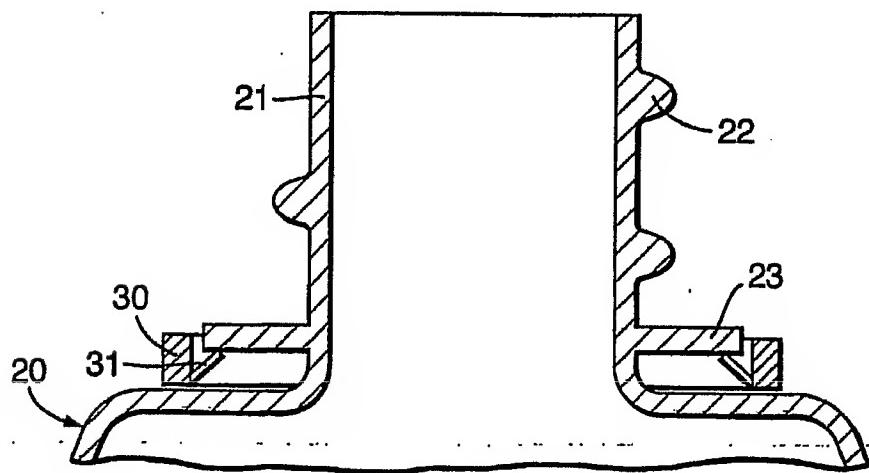
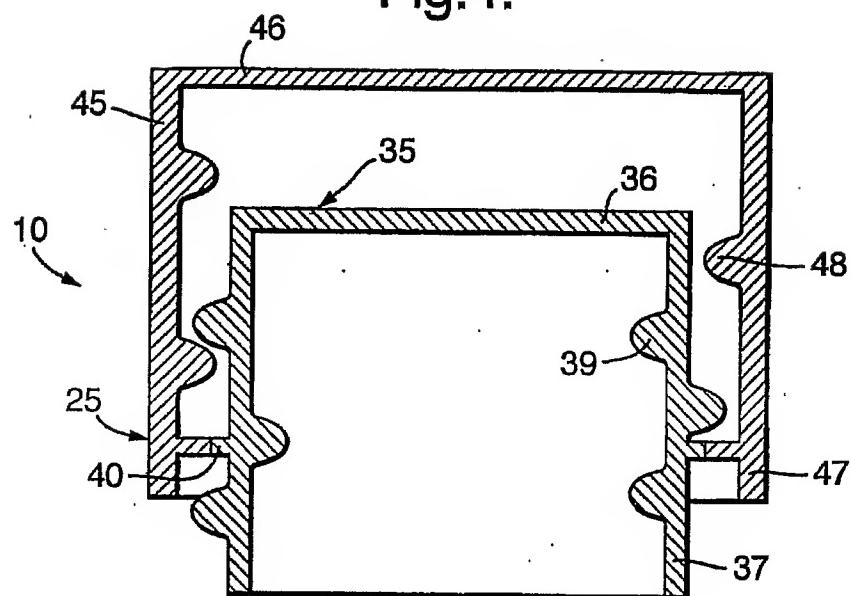


Fig.5.

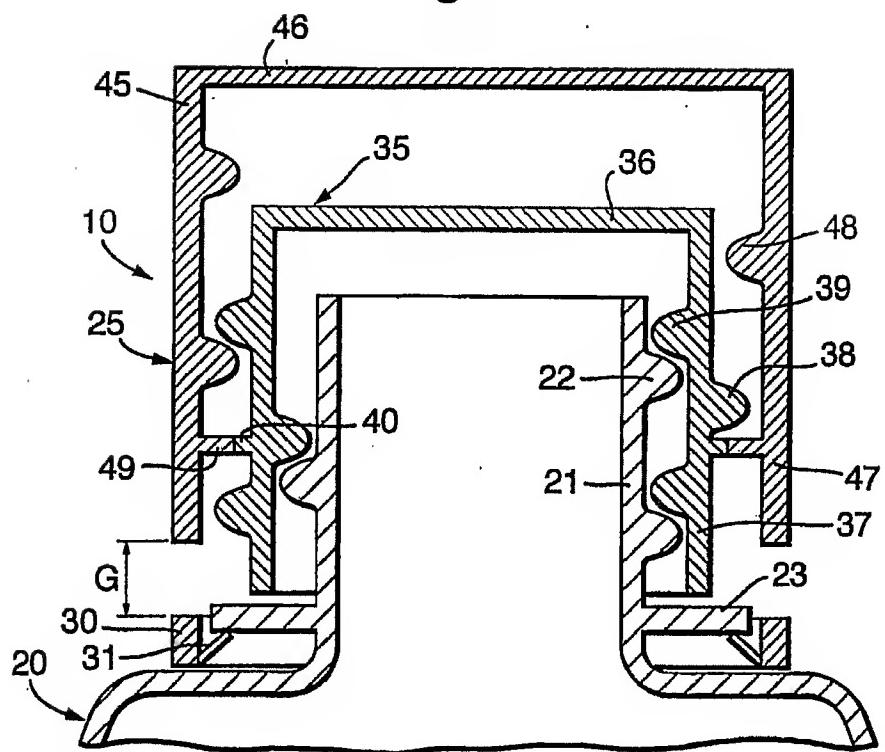


Fig.6.

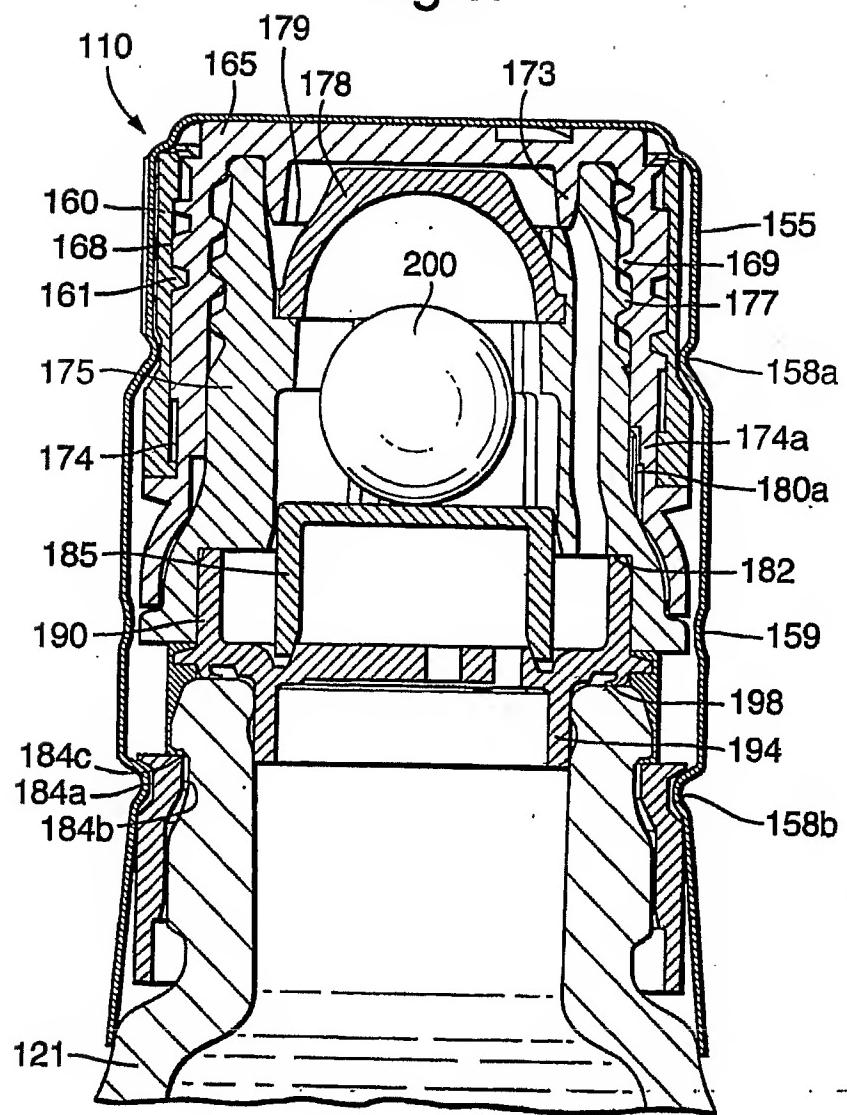


Fig.7.

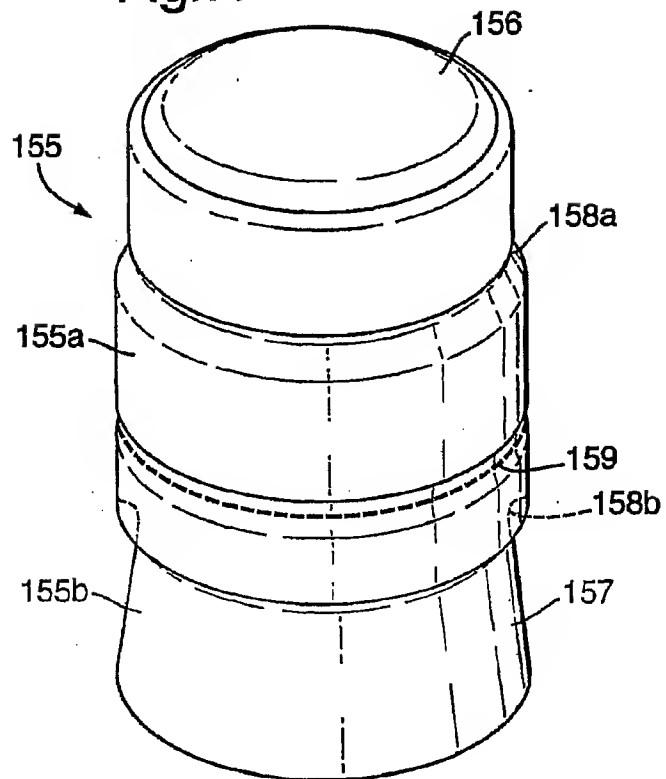


Fig.8.

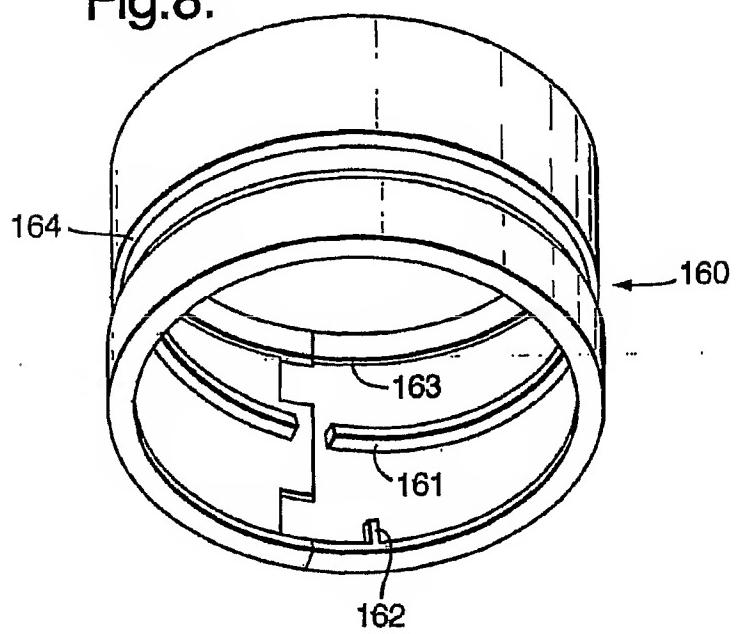


Fig.9.

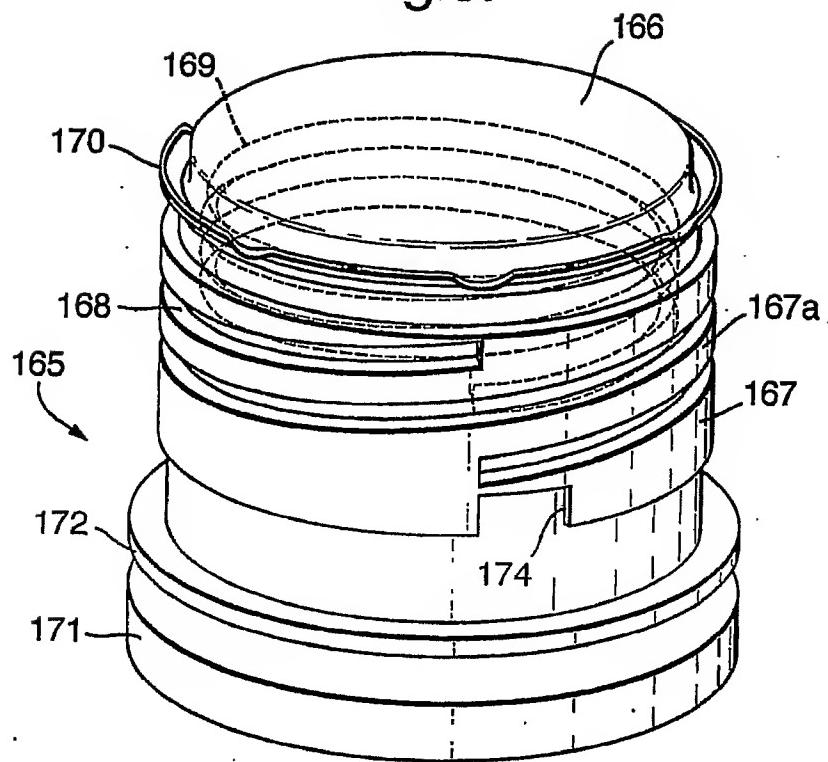


Fig.11.

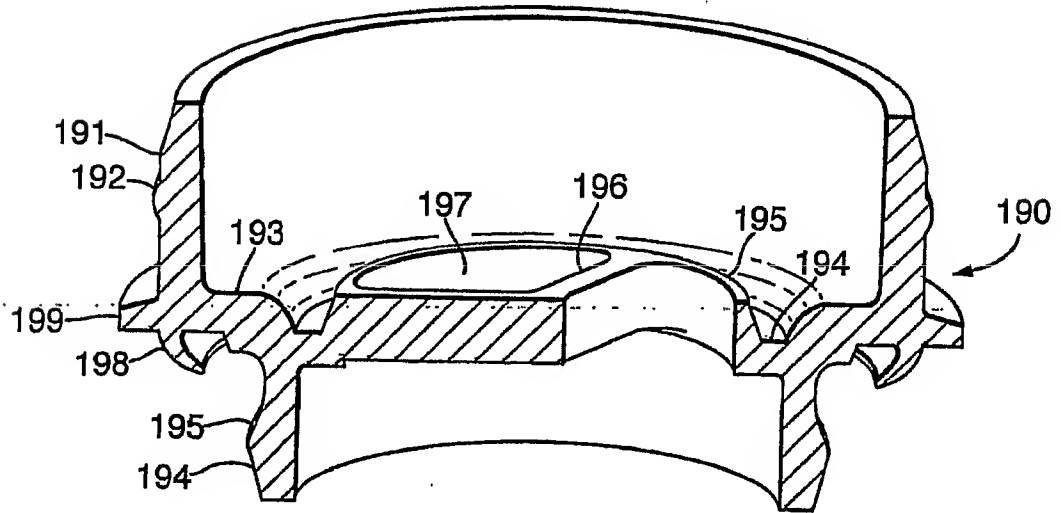


Fig.10.

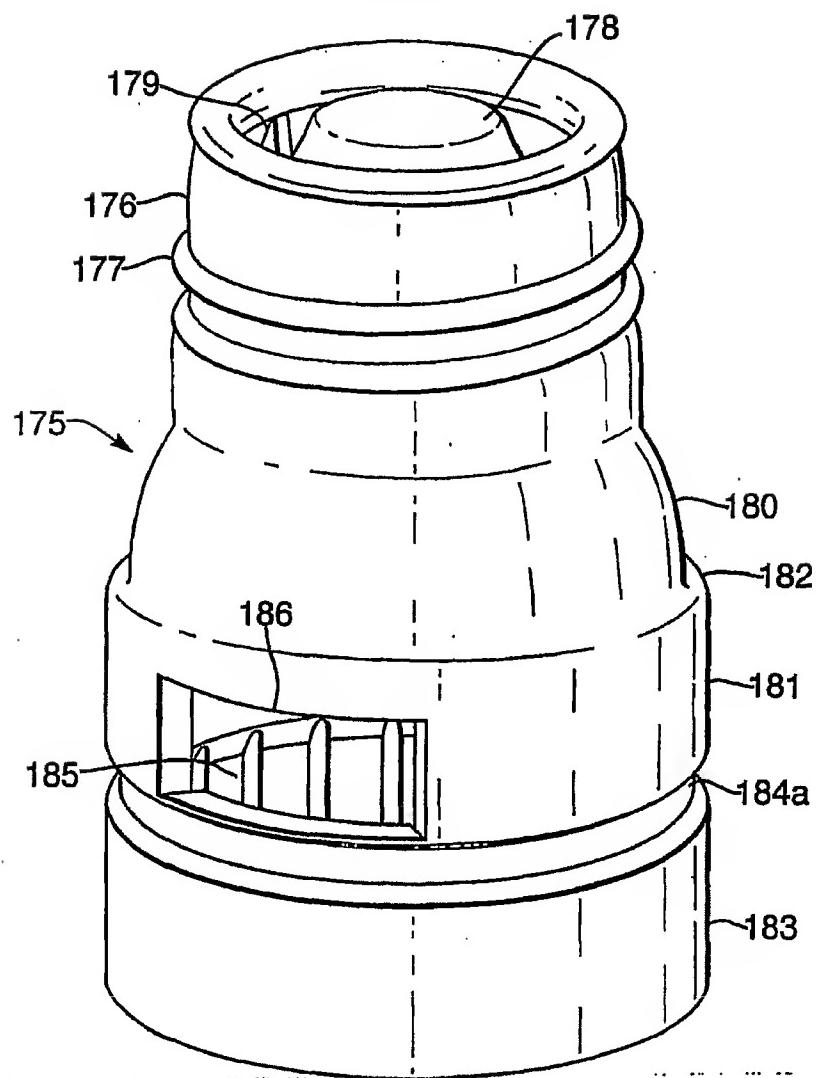


Fig.12.

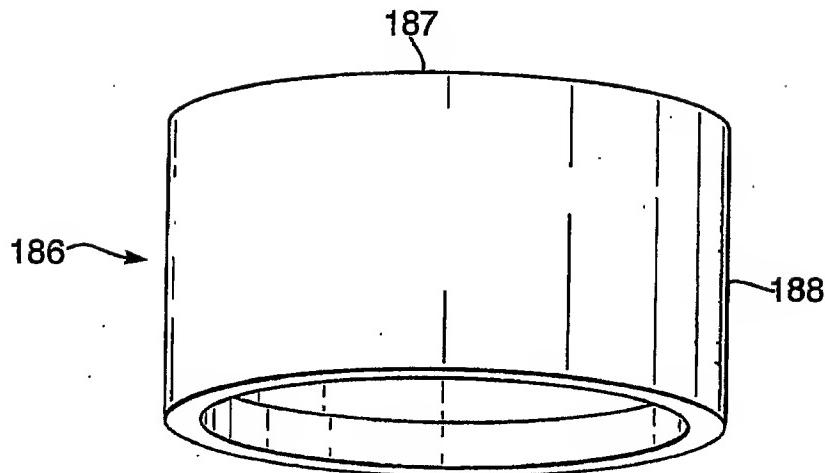


Fig.13.

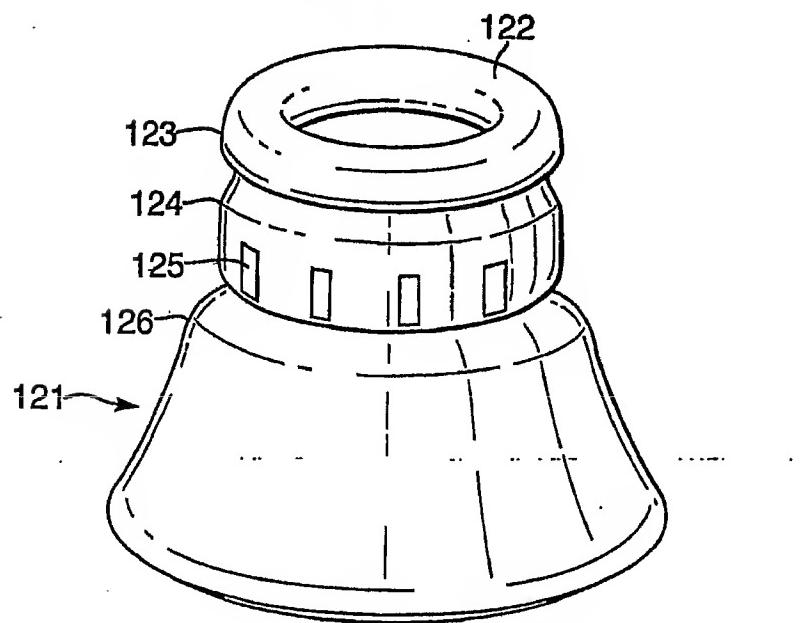
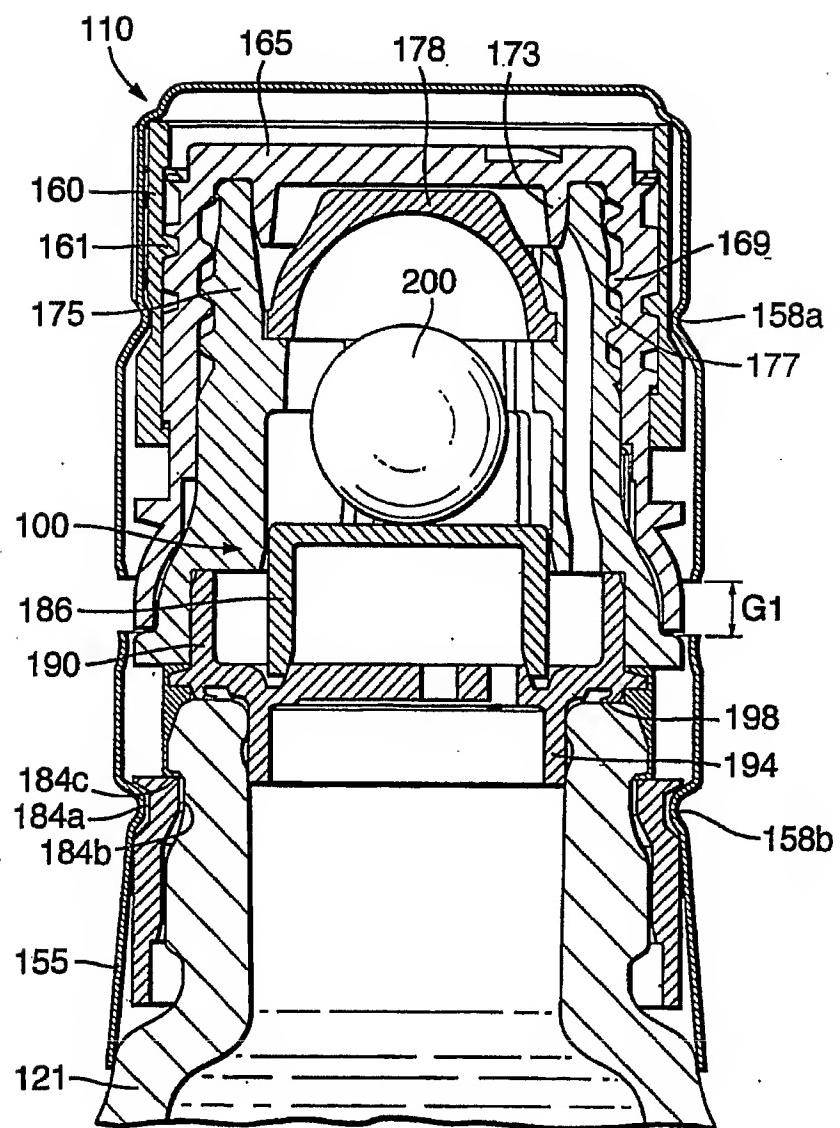


Fig.14.



**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- US 5738231 A [0003]
- WO 02096771 A [0003]



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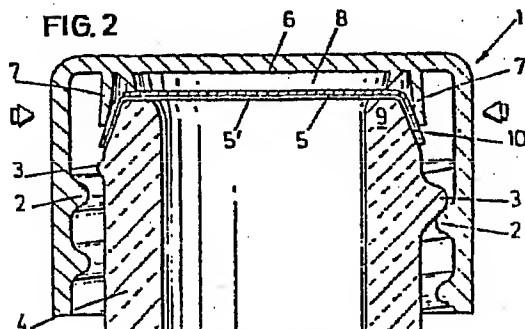
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(54) Procédé de scellage.

(57) Bouchon pour sceller de façon étanche un flacon ou un récipient analogue sur le rebord duquel un opercule d'étanchéité présentant une couche scellable destinée à venir en contact avec l'édit rebord coopère avec le bouchon pour réaliser le scellement étanche précité, caractérisé en ce qu'il comporte sur sa face interne 6, au moins un épaulement circulaire 7 qui, en position de fermeture du flacon ou récipient analogue 4, maintient l'opercule d'étanchéité 5 sur la zone périphérique externe 10 faisant immédiatement suite au rebord supérieur précité 9 pour permettre, par un traitement par induction p.ex., le scellement dudit opercule d'étanchéité 5 sur la zone périphérique précitée 10.

FIG. 2



L'invention a pour but de remédier à ces inconvenients et de prescrire un bouchon de conception nouvelle et originale ainsi que son procédé d'application qui résout les problèmes auxquels il vient d'être allusion et qui garantit un scellage absolument irréprochable.

A cet effet, le bouchon selon l'invention comporte sur sa face interne au moins un épaulement circulaire qui, en position de fermeture du flacon ou récipient analogue, maintient l'opercule d'étanchéité sur la zone périphérique externe faisant suite au rebord précité pour provoquer, par un traitement par induction, p.ex., le scellage dudit opercule d'étanchéité sur la zone périphérique précitée.

Toujours selon l'invention, la face interne du bouchon présente encore une couronne interne concentrique à l'épaulement circulaire précité, destinée à appliquer l'opercule précité sur le rebord supérieur du flacon ou récipient analogue.

L'invention concerne également le procédé d'application du bouchon selon l'invention.

D'autres détails et avantages de l'invention ressortiront de la description qui sera donnée ci-après d'un bouchon pour sceller de façon particulièrement étanche un flacon ou un récipient analogue ainsi que son procédé d'application, selon l'invention. Cette description n'est donnée qu'à titre d'exemple et ne limite pas l'invention. Les notations de référence se rapportent aux figures ci-jointes.

La figure 1 montre en coupe un bouchon selon l'invention avant son serrage sur un flacon sur le rebord supérieur duquel est disposé un opercule scellable.

La figure 2 montre en coupe le même bouchon vissé sur un flacon.

Le bouchon 1 selon ces figures est muni d'un pas de vis interne 2 pour s'adapter sur le pas de vis externe 3 ménagé à la partie supérieure d'un flacon 4.

Entre le bouchon 1 et le flacon 4 est inter-

Un scellage de l'espèce est intégral et s'oppose de la manière la plus totale à toute forme de migration du contenu ou d'un composant du flacon 4 vers l'extérieur de ce récipient, p.ex. du verre. Aucun dévissage accidentel ou intempestif du bouchon 5 ne peut donc avoir d'influence quelconque sur le conditionnement des produits contenus dans le flacon ou le récipient analogue.

La forme d'exécution se rapporte logiquement à toute fermeture susceptible d'être scellée par induction. En principe l'invention s'applique également à des récipients de forme différente dont la fermeture est réalisée par exemple par encliquetage ou "twist-off" permettant le rabattement du bord d'une feuille quelconque assimilée à l'opercule 5 sur le rebord supérieur du récipient de forme circulaire ou non, ou par exemple, par filet interrompu selon ce procédé dit "twist-off".

Il est bien entendu que l'invention n'est pas limitée à la forme d'exécution qui vient d'en être décrite et que bien des modifications pourraient y être apportées sans sortir du cadre de la présente demande de brevet.

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frein.

7. Procédé d'application d'un bouchon selon l'une quelconque des revendications 1 à 6, caractérisé en ce qu'après vissage du bouchon 1 sur le flacon 4, on soumet le bord de l'opercule 5 rabattu sur la zone périphérique 10 du flacon 4 un traitement par induction de manière à provoquer la fusion de la couche scellable 5' de l'opercule 5.

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DOCUMENTS CONSIDERES COMME PERTINENTS			
Catégorie	Citation du document avec indication, en cas de besoin, des parties pertinentes	Revendication concernée	CLASSEMENT DE LA DEMANDE (Int. Cl.4)
X	GB-A-2 096 980 (UNITED GLASS LTD.) * Page 2, lignes 20-55; page 2, ligne 117 - page 3, ligne 11; figures 5-9 *	1,2,7	B 65 D 41/04 B 65 D 51/20
Y	---	3-6	
Y	EP-A-0 055 916 (ETHYL PRODUCTS CO.) * Page 7, ligne 30 - page 8, ligne 36; page 2, lignes 12-28; figures 1-4 *	3-5	
A	---	1,2	
Y	US-A-4 076 152 (MUMFORD) * En entier *	4,5	DOMAINES TECHNIQUES RECHERCHES (Int. Cl.4)
Y	US-A-3 333 719 (HOHL) * Colonne 3, lignes 23-45; figures 3,4 *	6	B 65 D
A	FR-A-2 406 938 (METAL BOX) * Page 4, lignes 1-28; figure 1 *	1,7	
A	WO-A-8 500 154 (BEVCAP PLASTICS PTY. LTD.) * Page 2, lignes 13-25; figures 1,2 *	1,2,7	
	---	-/-	
Le présent rapport de recherche a été établi pour toutes les revendications			
Lieu de la recherche LA HAYE	Date d'achèvement de la recherche 07-01-1986	Examinateur MARTENS L.G.R.	
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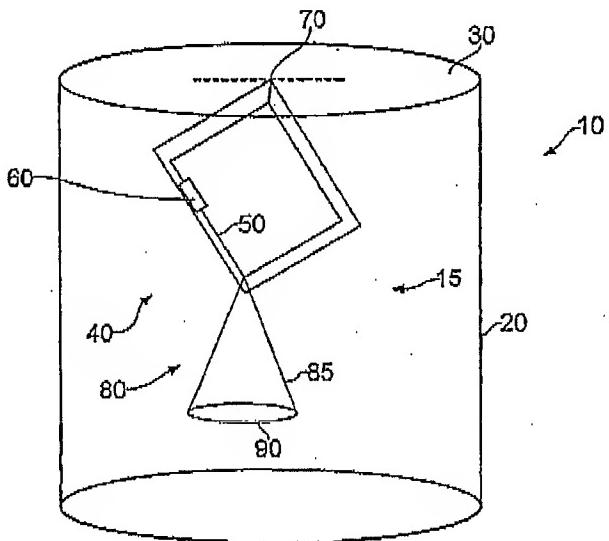
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(54) Title: CLOSURE WITH RFID DEVICE



(57) Abstract: A closure (10) and RFID device (15) in combination, wherein the closure comprises a metal shell and the RFID device comprises a tag (40) and antenna means (80). The tag (40) comprises an RFID chip (60) and an electrical circuit (50) and the antenna means (80) is adapted to be one side of a dipole. The RFID device is entirely located within the metal closure with and spaced from but electrically connected (70) to the metal closure (10) such that the closure becomes the other side of the dipole antenna.

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## CLOSURE WITH RFID DEVICE

The present invention concerns an identification device and the combination of an  
5 identification device and a metallic closure for use with containers such as bottles  
of spirits or wines.

Identification systems, such as "EAS" - Electronic Article Surveillance systems,  
are known in which a tag is detected by appropriate means. However, these operate  
10 at a relatively low frequency (below 100MHz) and typically only allow the  
detecting device to detect their presence or absence thereof.

Consequently, more advanced devices which can provide more information have  
been produced. These devices are known as radio frequency identification tags,  
15 also known as "RFID" tags. These devices have recently become widespread in the  
packaging industry.

The chip within the RFID tag can contain a relatively large amount of information  
which may be read, and/or in some cases written to, remotely by a reading device.  
20 The tag can be active in that it is powered by an incorporated battery to actively  
transmit a signal or, as is more typical, can be passive in that it is activated when  
an appropriate external radio signal is transmitted by a reading device and received  
by the RFID tag.

The information is typically concerned with the product to which the tag is attached. For instance the information can be the date the product was made, the source of the product, its weight, size, intended destination, stock number etc. US patent application published as US2004143505 discusses the use of RFID tags for  
5 inventory control.

This information is broadcast by the RFID tag using radio frequency radiation which can lie anywhere in the radio frequency range. However, ultra high frequency (UHF is typically defined as 300 to 3000 MHz) is preferred over low  
10 frequency for various reasons including that of increased range and use of smaller antenna requirements due to use of smaller wavelengths.

Although most RFID tags are readable when they are attached to the external surface of objects there are exclusions to this. For instance, if an RFID tag is  
15 placed on the surface of an object which is even slightly electrically conductive, for example metal or glass, the signal strength produced by the tag is greatly reduced. This is exacerbated by the presence of liquid inside the object. One way to overcome this is to place an insulating layer between the tag and the surface of the object. However, this layer has to be relatively thick, a feature which can  
20 detract from the aesthetics of the packaging. Further, surface mounted tags can be easily tampered with, or become accidentally damaged.

3.

One way to overcome this problem is to place the tags inside the packaging.

- However, this can cause other problems in that the walls of the object can interfere with the radio signals and can even block them completely. This is especially the case when the walls are made of metal. In the packaging industry there is a desire  
5 to fit RFID tags to bottles. However, as discussed above, there are inherent problems with this. It has, however, been found that the closure can be used to hold the tag.

European patent EP 0619243 A describes a closure with an electromagnetically

- 10 detectable device located therein. However, the device is located against the inside flat surface of the top plate of the closure. This means that if the closure is made of metal, which is often the case for spirit bottles, the device will not be readable remotely since the metal layer will interfere with the radio frequency radiation.

- 15 International patent application WO 0026878 describes how this may be overcome by locating part of the device perpendicularly below the closure such that it is outside of the metal closure walls. However, the presence of a device hanging down inside a bottle neck which would be visible to the consumer is undesirable for aesthetic reasons. Further, such a system would make the fitting of the closures  
20 to the bottles difficult without causing damage to the device due to the nature of present day high-speed filling and closure-fitting lines.

It is desirable to be able to fit RFID devices fully inside metal closures but still be able to read them remotely.

More recently, it has been proposed in international patent application WO 2005/024745 to provide an RFID tag on a container having a metal closure where the system is mounted within or externally of the metal closure. There is, however, a limit to the range at which a transmitted signal can be detected with  
5 such an arrangement.

In the applicant's co-pending European patent application (un-published at the time of filing), there is disclosed an advance on the above-mentioned prior art in which the invention disclosed therein provides an RFID device and a closure and  
10 RFID device in combination. The closure comprises a metal shell and the RFID device comprises an RFID chip and antenna means. The antenna means is adapted to be one side of a dipole, and the RFID device is entirely located within the metal closure with the device electrically connected to the metal closure so that the closure becomes the other side of the dipole antenna.

15

As a further development, the applicants have found that, by adopting a similar approach to that disclosed in our aforesaid application, the same result can be achieved without necessarily having a direct physical electrical connection between the RFID device and the closure.

20

Thus, where used hereinafter, unless the context clearly determines otherwise, the expression "electrically coupled" includes indirect electrical contact including inductive coupling and capacitive coupling. This permits, where advantageous, the provision of a wad within the metal closure. It also has the advantage that lacquer

coatings such as are commonly employed on closures such as bottle caps do not have to be removed or otherwise disrupted to establish electrical contact between the metal of the closure and the RFID chip

- 5 According to one aspect of the present invention there is provided an RFID device for a closure comprising an electrically conductive shell, the device comprising a tag and antenna means, the tag comprising an RFID chip and the antenna means comprising one side of a dipole, the device being, in use, entirely located within a metal closure and spaced therefrom but electrically coupled thereto such that the
- 10 closure becomes the other side of the dipole.

According to a further aspect there is provided a closure and RFID device in combination, wherein the closure comprises an electrically-conductive shell and the RFID device comprises a tag and antenna means, the tag comprises an RFID chip, and the antenna means is one side of a dipole, the RFID device being entirely located within the closure and spaced from but electrically coupled to the closure so that the closure becomes the other side of the dipole.

The spacing may be as a result of, for example, an air gap, a sealing wad or a layer  
20 of lacquer, all of which would have an insulating effect.

By electrically coupling the RFID tag to the closure, such that the closure becomes one side of a dipole antenna, it has been found that it is possible to remotely read the RFID tag. This reading may occur both at the sides and above the closed end

of the closure.

Two major advantages of a non-contact tag are: i) that the tag can be hermetically sealed within the insert; and ii) that inside of the metal closure can be entirely  
5 lacquered.

The antenna may be of various shapes. Each different shape produces a differently shaped radiation pattern. It is considered to be useful to be able to influence the shape of the radiation pattern produced by the device for differing applications.

10 An example of a suitable shape is a cone.

In one embodiment, a spacer is used to bring the device closer to the open end of the closure. This further enhances the strength of the signal measured remotely and therefore increases the distance over which the tag may be read.

15

In another embodiment of the invention, the device is positioned inside an insert to protect it.

20 In yet another embodiment the antenna can be made to contact a liquid contained in an associated container. This has the advantage of boosting the strength of the radio frequency field.

In another aspect, the invention provides a closure and RFID device in combination, wherein the closure comprises an electrically-conductive shell and the RFID device comprises an RFID chip and antenna means, and the antenna means is adapted to be one side of a dipole, and the RFID chip being spaced from 5 but electrically coupled to the electrically-conductive closure so that the closure becomes the other side of the dipole antenna, the closure and RFID device combination being associated with a body of liquid, and the antenna means being in contact with the body of liquid.

- 10      The shell is a closure such as a closure cap for a bottle which may be threaded for securing on a threaded neck of a bottle such as may contain wine, spirits or liqueurs. The shell may be formed of metal or may be of a metallised material such as a suitable plastics material coated with a functional and/or decorative metallic coating on its interior and/or exterior surfaces. It will also be appreciated  
15      from an understanding of the ensuing description that the invention is equally applicable to and useful for closures of the type which provide a push-fit in the neck of a bottle.

- 20      The present invention also provides, in another aspect, a closure and RFID device in combination, wherein the closure comprises a member which is arranged to provide a tight sealing fit within a neck of a container, the closure comprising electrically-conductive material and/or being coated with electrically-conductive material, and wherein the RFID device comprises an RFID chip and antenna means, and is accommodated within the member, and the antenna means is one

side of a dipole, and the RFID device being entirely located within the closure and spaced from but electrically coupled to the closure so that the closure becomes the other side of the dipole.

- 5 According to a further aspect there is provided a closure and RFID device in combination, wherein the closure comprises a metal shell and the RFID device comprises a tag and antenna means, wherein the tag comprises an RFID chip and an electrical circuit, and wherein the antenna means is adapted to be one side of a dipole, and the RFID device is entirely located within the metal closure with the  
10 electrical circuit electrically coupled to the metal closure so that the closure becomes the other side of the dipole antenna.

The invention further provides, in another aspect, a closure and RFID device in combination, wherein the closure comprises a member which is arranged to provide a tight sealing fit within a neck of a container, the closure comprising electrically-conductive material and/or being coated with electrically-conductive material, and the RFID device comprising an RFID chip and antenna means, and the antenna means being adapted to be one side of a dipole, and the RFID chip being spaced from but electrically coupled to the electrically-conductive closure so  
15 that the closure becomes the other side of the dipole antenna, the closure and RFID device combination being associated with a body of liquid, and the antenna means being in contact with the body of liquid.  
20

The invention is applicable to closures such as bottle caps and stoppers and to  
25 closures for aerosol spray containers and like.

Embodiments of the invention will now be described, by way of example, with reference to the following drawings in which:

Figure 1 shows diagrammatically a side view of a combination of a closure  
5 with an RFID tag and antenna according to one embodiment of the invention;

Figure 2 shows diagrammatically a side view of a combination of a closure with an RFID tag and antenna according to another embodiment of the invention;

Figure 3 shows diagrammatically a side view of a combination of a closure with an RFID tag and antenna according to yet another embodiment of the  
10 invention;

Figure 4 shows diagrammatically a side view of a combination of a closure and an RFID device according to a further embodiment;

Figure 5 shows diagrammatically a side view of a combination of a closure and an RFID device according to a still further embodiment;

15 Figure 6 is a perspective view of an RFID device formed according to the present invention;

Figure 7A is a perspective view of an insert for use in combination with an RFID device formed in accordance with the present invention;

Figure 7B is a section of the insert of Figure 7A;

20 Figure 8A is a section illustrating the RFID device of Figure 6 incorporated into the insert of Figures 7A and 7B;

Figure 8B is a perspective view of the RFID device/insert of Figure 8A;

Figure 9 shows diagrammatically the RFID device/insert of Figures 8A and 8B incorporated into a metal closure;

Figure 10 is a section of the closure of Figure 9 fitting onto a container neck;

Figure 11A is a perspective view of an RFID device formed according to the present invention;

5 Figure 11B is a side view of the RFID device of Figure 11A; and

Figure 12 is a section of a stopper formed in accordance with the present invention.

In Figure 1, a closure is generally indicated 10. The closure 10 is formed from  
10 aluminium and has a crown 30 and a depending skirt 20. In use, the skirt 20 would sit around and outside a container neck (not shown) in a manner generally understood. Accordingly, the skirt 20 may have a screw thread or snap bead or other means formed therein for retaining the closure to the container neck.

15 Also shown in Figure 1 is an RFID device 15 comprising a tag 40 and an antenna 80. The tag 40 comprises a substrate in the form of a rectangular plane circuit board 45 on which an RFID chip 60 is located. The antenna 80 is connected to the circuit board 45 and a rectangular loop 50 of conducting material (e.g. copper) acting as an impedance circuit is located on the circuit board 45 for connecting the  
20 RFID chip 60 and the antenna 80 together. The function of the loop 50 is to match the impedance of the antenna to the lower impedance of the chip. The loop 50 may be shaped into any suitable form, such as a triangular or circular.

The circuit 50 is connected to the underside crown 30 of the closure 10 at connection point 70. This connection may be achieved by soldering or other such well known methods. The underside of the crown 30 is coated by a thin layer of lacquer (not shown), which physically spaces and insulates the circuit loop 50 from the electrically conductive metal closure shell. However, electrical conduction can occur between the loop 50 and the closure by induction. In this way the closure 10 becomes the other one side of a dipole antenna.

The RFID tag 40 is mounted so that, while not in direct physical and electrical contact with the closure 30, by positioning the tag sufficiently closely to the closure, the same result can be achieved provided that the RFID is responsive to signals within certain frequency ranges. It has been found that positive results have been obtained with a passive RFID with signals in the range of 800 MHz to 900 MHz and more specifically in the range 860 to 870 MHz.

15

Though reference is made to the closure 10 being of metal, it is to be clearly understood that the closure may be made from other materials which are electrically-conductive, including suitable plastics materials which may be coated or impregnated with electrically conductive materials.

20

The tag 40 is held in the closure 10 such that it depends downwardly from the crown 30 towards the open end of the closure 10. Although the tag 40 is shown as depending by one corner so that the sides of the substrate are not parallel with the sides of the closure 10, this is not essential and in fact the tag 40 could lie square

with the closure sides. However, it has been found that, if the substrate is positioned substantially parallel to the crown 30, the strength of the signal is reduced such that it is difficult to read the tag remotely from the closure.

5 The antenna 80 is shown in the form of two diverging wires 85 extending downwardly (i.e. towards the open end of the closure 10) from the RFID tag 40. This antenna acts as the other side of the dipole antenna to the closure shell.

A further optional wire is shown in the form of a loop 90 which has its major plane 10 parallel to the plane of the crown 30 of the closure 10. The loop 90 connects between the two wires 85 at their ends opposite their connection to the loop 50. Although the antenna 80 has been shown in this form it can take other forms such 15 as a single straight wire or a cone of metal foil wherein the apex of the cone is connected to the substrate. All of these forms have the effect that the antenna becomes circularly polarised. Further, whichever form is employed, it has been found that the antenna 80 need not extend downwardly beyond the edge of the closure 10 for the RFID chip 60 to still be read by the reader.

The RFID chip 60 is a standard UHF RFID transponder integrated circuit which 20 operates in the range 860 to 960 MHz, preferably 869 MHz. One example of such a chip is called "AMS3981". To read the RFID tag 40 a standard reader is used. For instance a Bistar MR100 Reader could be used.

It will be noted that the RFID device 15 is contained entirely within the closure 10 i.e. no part of the device projects beyond the open end of the skirt 20.

It has been found that, in one embodiment, if the antenna 80 is allowed to make  
5 contact with a body of liquid it has the effect that the strength of the signal is boosted so that the RFID tag 40 can be read from a greater distance. However, the antenna in this case needs to be insulated from electrical conduction with the liquid, for example by means of a non-electrically conducting layer of plastics material. Further, the antenna (80) should, in this case, contact the liquid outside of  
10 the closure.

Referring now to Figure 2 there is shown an alternative embodiment.

A closure is generally indicated 110 and comprises a crown 130 and a depending  
15 skirt 120. An RFID device is generally indicated 115 and comprises a tag 140 and an antenna 180.

The tag 140 comprises a circuit board 145 on which an RFID chip 160 is located.  
The antenna 180 comprises a cone of metal foil material and is connected directly  
20 to the chip 160 i.e. there is no circuit loop.

The closure 110 has a sealing wad 129 in the form of a cardboard disk which is fitted into the closed end, where it abuts against the underside of the crown 130.

The device 115 is mounted behind the wad 129 i.e. with the wad interposed between the device 115 and the closure crown 130. The device 115 is retained in position by adhering the board 145 to the sealing wad 129.

- 5 The tag 140 is mounted adjacent the underside of the crown 130 with the board 145 running parallel to the crown 130 and with the antenna 180 depending from the chip 160.

10 The "contactless" principles of the present invention permit the inclusion of the sealing wad 129. The wad 129 gives a 2mm spacing between the device 115 and the closure 110 but electrical coupling still occurs in use.

15 Figure 3 shows a variation of the arrangement depicted in Figure 1. Instead of the tag 240 being positioned immediately underneath the crown 230, it is positioned at a certain distance away. This is achieved by inserting an electrically conducting inverted "top-hat" shaped spacer 231 into the closure 210.

20 The spacer 231 has a base 232 which is in contact with the lacquer layer of the crown 230. Depending downwardly from the base 232 is a cylindrical wall 233 which has an end plate 235. The purpose of the spacer 231 is to distance the tag 240 from the crown 230, so that the antenna 280 is closer to the open end of the closure 210, while keeping the circuit 250 connected to the crown 230 such that the closure acts as one side of the dipole antenna. Accordingly, the spacer 231 does not need to be a "top-hat" shape but could be other shapes so long as it fulfills the

stated purpose. The spacer can be made from copper or other electrically conductive materials, including some plastics, to improve conductivity.

The circuit 250 is shown as being connected at each of ends two 271, 272 to the 5 end plate 235. However, this is not critical and the circuit could be connected in the same manner as shown in Figure 1. Furthermore, the various antennas described in relation to Figure 1 may also be employed.

Referring now to Figure 4 there is shown a closure 310 with a sealing wad 329. A 10 device 315 similar to the device 215 shown in Figure 3 is mounted in the closure.

Again, this arrangement, as with that of Figure 3, is implemented with the spacer 333 not in direct electrical contact with the closure, in this case due to the wad 329. The base 332 can be mounted within the closure and be of dimensions such that 15 the RFID chip is spaced from but in close proximity to the closure. The cylindrical wall 333 is shortened axially so that the end plate 335 is closer to the crown 350 of the closure 310 than in Figure 3, while the tag 340 is mounted on the end plate 335. The device 315 is held in position by a retaining disc 336 held in position by internally directed crimpings 337 of the skirt 320..

Figure 5 shows a variation of the embodiment shown in Figure 3. The central axis "A" of the closure 410 is indicated with a broken line. In this Figure it can be seen that the lower antenna has been replaced by two plates 481, 482 positioned perpendicularly to axis "A". The plates 481, 482 are in the form of copper discs.

The plates 481, 482 are suspended below, and electrically connected to, the tag 440 by means of connectors 483, 484; such connections can be provided by copper wires. The plates 481, 482 act as one side of the dipole antenna (in the same way that the antenna 280 does) and act to increase the area of one side of the dipole antenna. Although two discs are shown, other numbers of discs, including only one, would function. Also, shapes other than circular discs may be used.

It will also be noted that the chip 460 is aligned with the central axis "A" of the closure 410. This improves the regularity of the radiation pattern produced by the device which improves reading of the tag 440.

Figure 6 shows a device 515 similar to the device 415 in Figure 5 and adapted to fit within an insert 595 shown in Figures 7A and 7B. The device 515 and insert 595 are shown fitted together in Figures 6A and 6B and the device/insert are shown fitted into a metal closure 310 in Figure 9. The device/insert/closure are shown fitted onto a container neck in Figure 10.

Referring first to Figure 6 the device 515 comprises a spacer 531, a circuit board 545 and an antenna 580 and accordingly is similar to the device shown in Figure 5.

20

Referring now to Figures 7A and 7B the insert 595 has a cylindrical wall 596 which is closed at one end by a tapering wall 597 and end plate 598. Referring also to Figures 8A and 8B, the other end of the wall 596 is open and has the RFID device 515 inserted such that the base plate 532 rests on top of the cylindrical walls

596. The two copper plates 581, 582 are positioned such that the lower and smaller plate 582 rests on the end plate 598 and the upper and larger plate 581 rests on the junction between the cylindrical wall 596 and the tapering wall 597. The tag 540 is seen to depend straight down from the end plate 535. The connections 583, 5 584 between the tag 540 and the two plates 581, 582 may also be seen.

Figure 9 shows the device 515 as described with reference to Figure 6 mounted in the insert 595 which is mounted on the spacer 531. This insert 595 can be advantageously formed of extruded plastics material and is suitable for being itself 10 inscribed into a closure 510 (indicated in broken lines in Figure 7) having a sealing wad 529.

The insert 595 also has a rim 599 which has a greater diameter than the cylindrical wall 596 and which acts to hold the insert 595 inside the closure 510. Further, 15 between the rim 599 and the cylindrical wall 596, a stop block 596b is located on an annular flange 596b which extends around the circumference of the open end of the insert wall 596. The stop block 596b acts to limit axial movement onto the neck 506 of the associated container during fitting in conjunction with a sealing washer 507, in a manner well understood and as shown in Figure 10. Once fitted 20 to the neck 506, the closure 510 is "rolled" on to give the final form shown. The inward crimpings of the closure help to retain the insert 595 in position.

Since the base 532 of the spacer 531 is made of metal or other electrically conducting material it provides an electrical conduction area on the inside of the crown 530 of the closure 510 across a considerable area to promote conductivity between the two and ensure that the closure 510 may become one side of the 5 dipole antenna.

Another aspect to the subject of electrical conduction is that of the nature of the material making up the associated container. Typically, such material will be glass. It has been found that glass can be slightly electrically conductive and therefore 10 when a closure with an RFID device has been fitted, an electrical connection between the container and the closure can occur. This in turn has the effect that the whole of the container becomes part of one side of the dipole antenna encapsulating the other side. This encapsulation reduces the strength of the signal and radiation field and accordingly reduces the distance over which the tag 540 15 may be read.

To overcome this problem, the container needs to be electrically insulated from the closure, and this can be achieved by applying a layer of lacquer to the inside walls 511 of the closure 510. Other means are of course possible. Although the concept 20 of increasing the distance over which the tag 540 may be read by contacting the antenna with a body of liquid has been described in relation to a container and closure, it should also be understood that this could also apply in fields other than packaging wherein there is no closure as such.

In the above-described embodiments, the circuit 550 has been shown as a loop. This loop is a characteristic of the AMS3981 chip and can be eliminated for other chips such that the circuit is only linearly connecting the closure 510 on one side and the antenna on the other. It has been found that using a loop 550 allows 5 reading of an EM Marin 4222 chip in place of an AMS 3981 chip. In normal use when used with a dipole antenna the EM Marin 4222 chip does not require such a loop.

In such circumstances it may be possible to do without the substrate and merely 10 have the chip electrically connected to the closure or end plate by means such as a copper wire.

In one embodiment, the distance over which the tag 540 may be read is 5cm above the base 530 and 12 cm radially outwards from the sides 511 of the closure 510. 15 When the antenna 580 is in contact with a liquid the distance increases to more than 50 cm.

An added advantage of the insert 595 is that it protects the RFID device from mechanical and chemical damage. Furthermore, it can be pre-assembled which 20 helps in the manufacturing of the finished article.

Although the insert 595 has only been shown and described with reference to the embodiment in which the plates 581, 582 are employed. It will, of course, be

understood that it is possible to fit other devices described herein inside such an insert.

Referring now to Figures 11A and 11B there is shown a device 615 formed according to an alternative embodiment. The device 615 is similar to those shown in Figures 5 and 6 and comprises a spacer 631 with a base 632 and a depending cylindrical wall 633 having an end plate 635. The device 615 also comprises a tag 640 connected to the plate 635 and an antenna arrangement comprising two disks 681, 682 connected to the tag 640.

10

The base 632 is a disk with a plurality of cut-outs 632a giving a discontinuous periphery which improves electrical conduction. The cylindrical wall 633 includes a wedge-shape notch 634 which prevents electrical current flowing in a loop around the wall 633.

15

The tag 640 is formed as a chip 660 supported on a triangular loop circuit 650. One leg 651 of the loop 650 connects to the plate 635 to the disk 681. A second leg 652 of the loop 650 also connects the plate 635 to the disk 681. The chip 660 is connected within the leg 652. A third leg 653 of the loop connects the legs 651, 20 652 together and runs across the disk 681. The disk 681 has cut-outs 681a in a similar way to the base 632 to improve electrical conduction. The disk 682 is joined to the disk 681 by a connector 684.

Referring now to Figure 12, there is illustrated therein a further embodiment of the present invention as applied to a stopper member such as a cork for a wine or liqueur bottle or the like. Traditional stopper members are formed from cork but are being replaced by stopper members formed of plastics materials. Where such stopper members are used, these can comprise electrically conductive materials or be coated or clad therewith. An example of such a stopper member 700 mounted in a glass bottle neck 706 is shown.

The stopper member 700 comprises a head portion 701 and a hollow barrel portion 702 which forms a frictional fit in the neck 706 of the bottle. In the illustrated example, the head portion 701 of the stopper member is clad with an electrically-conductive outer skin 703 of metal which may be decorated or embossed. Within the hollow barrel portion 702 is mounted an insert 795 with a device 715 which is similar to that shown in Figure 9 and therefore need not be further described.

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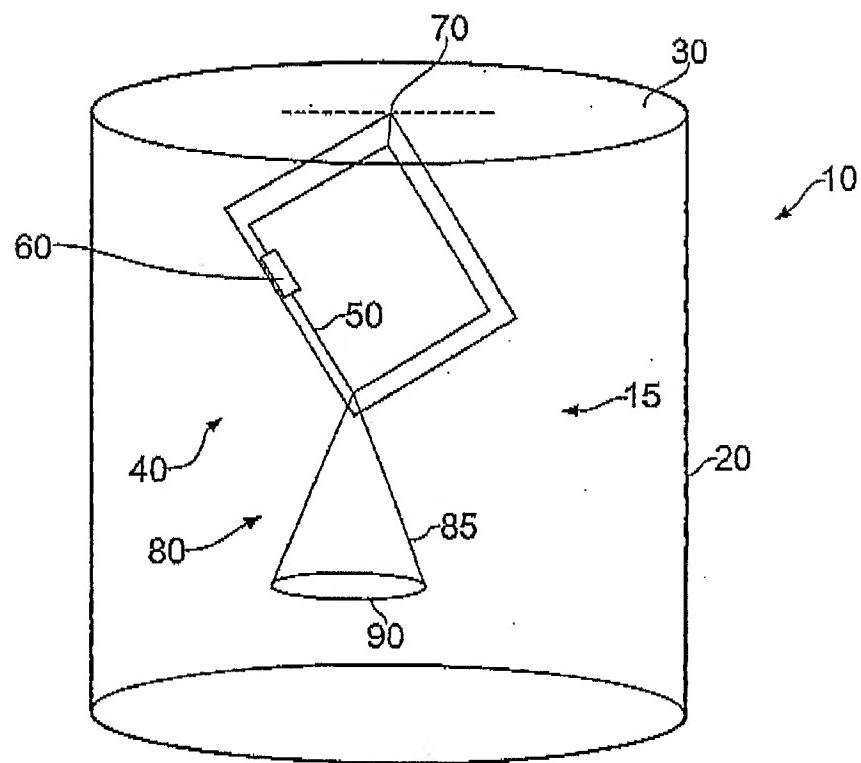


Fig. 1

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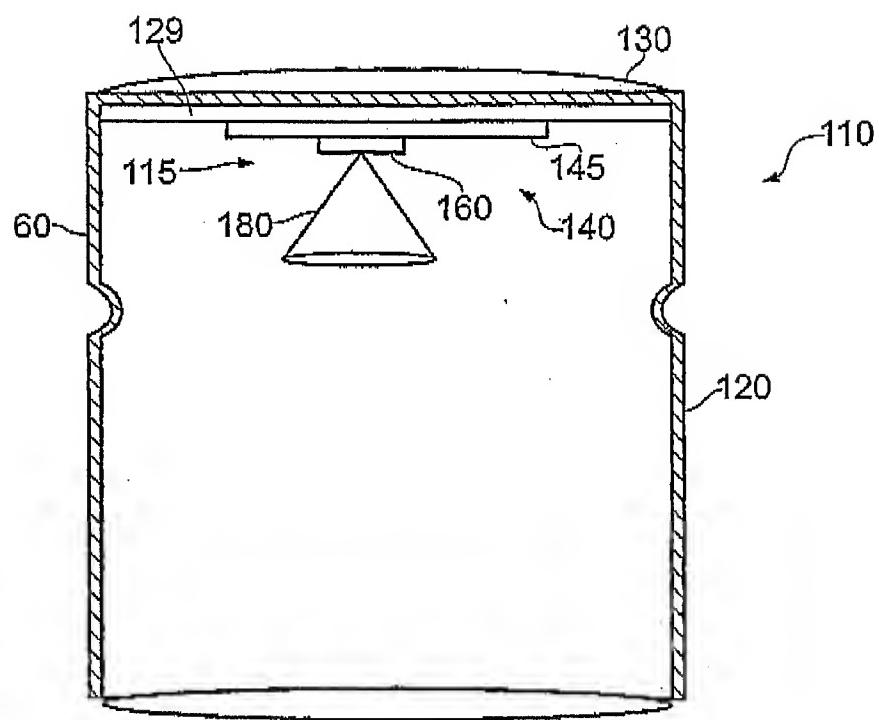


Fig. 2

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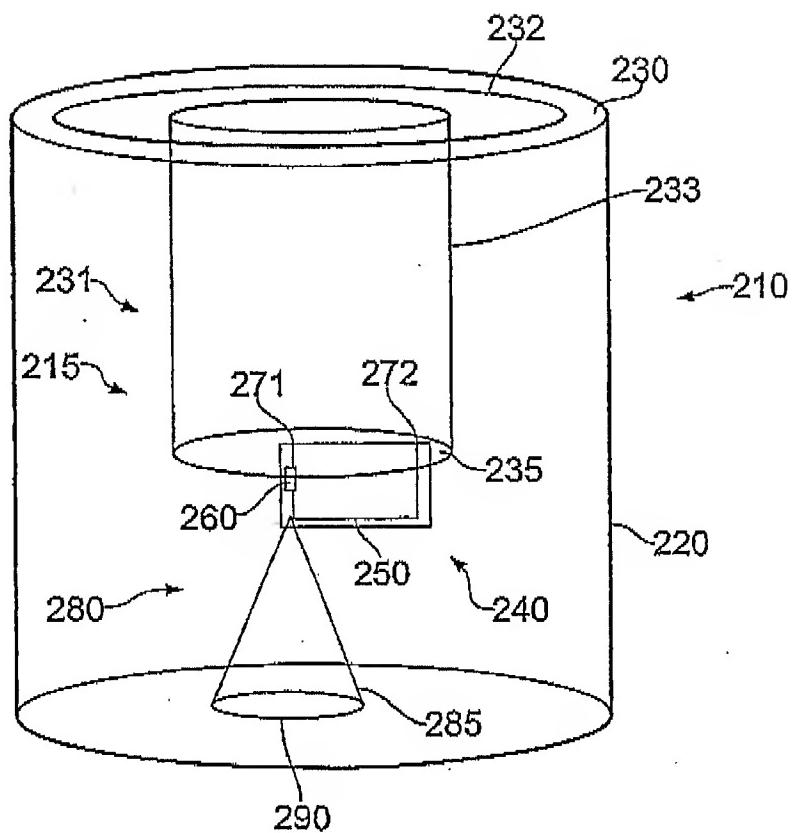


Fig. 3

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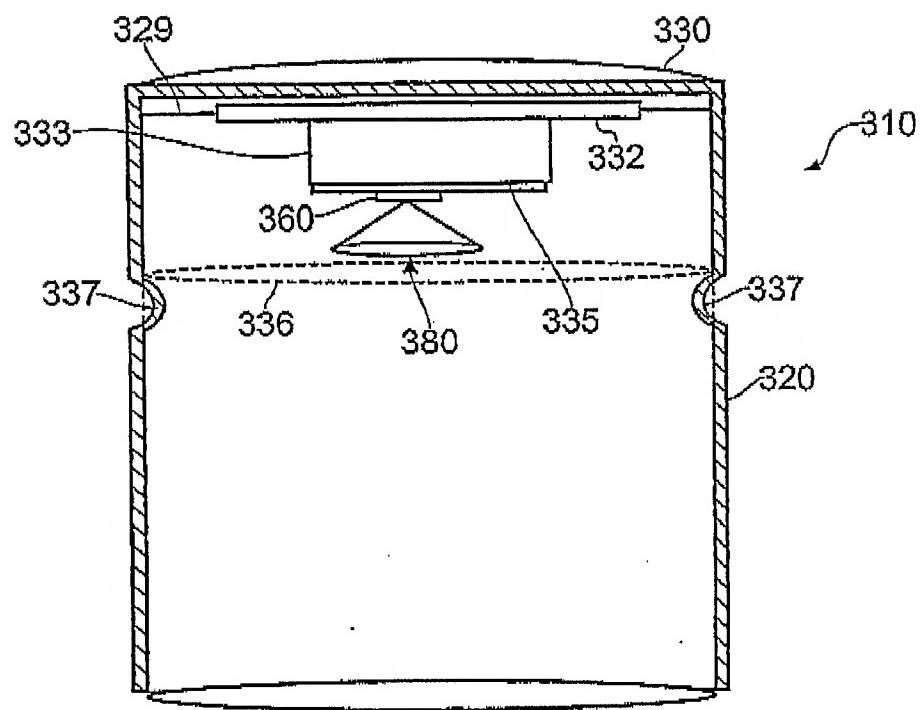


Fig. 4

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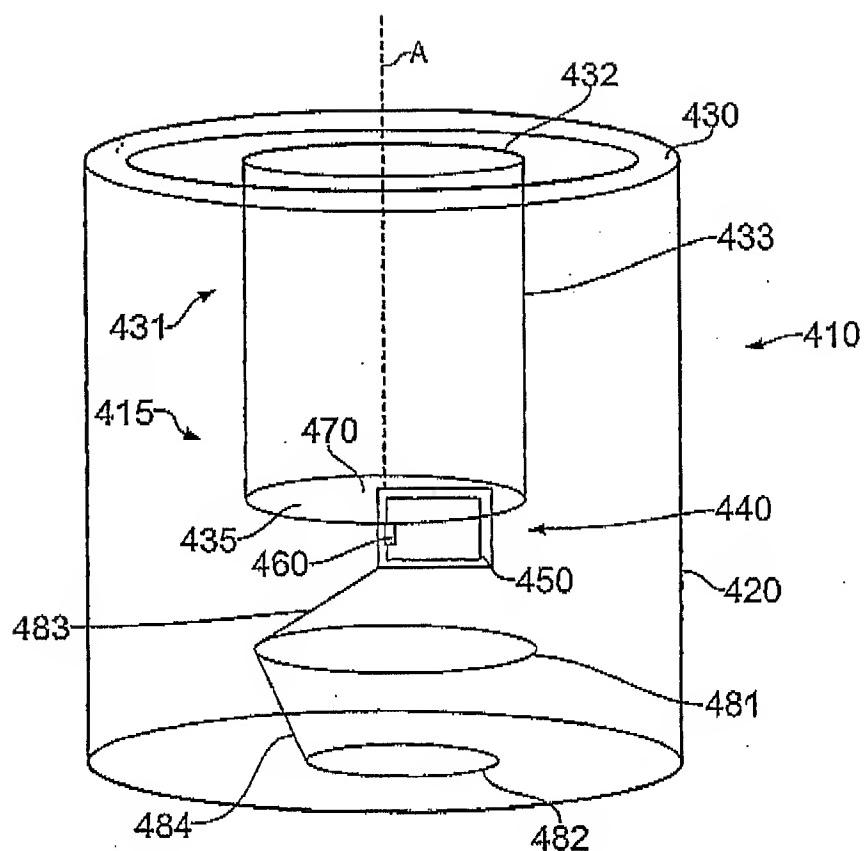


Fig. 5

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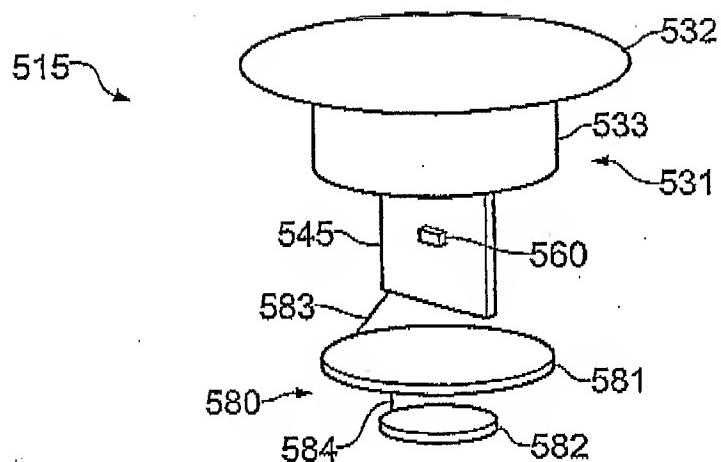


Fig. 6

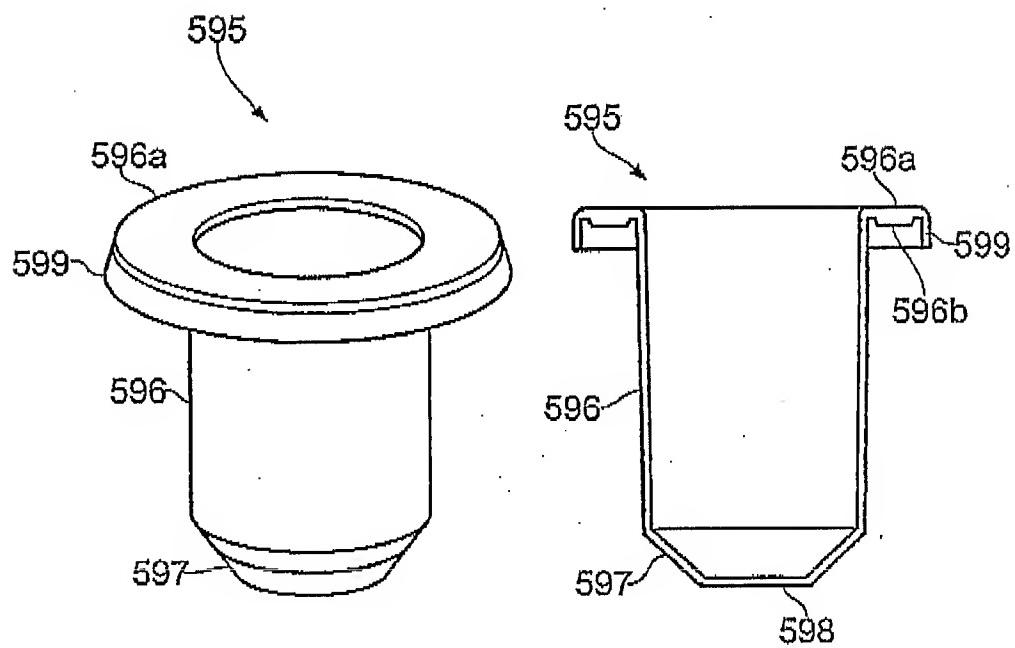


Fig. 7A

Fig. 7B

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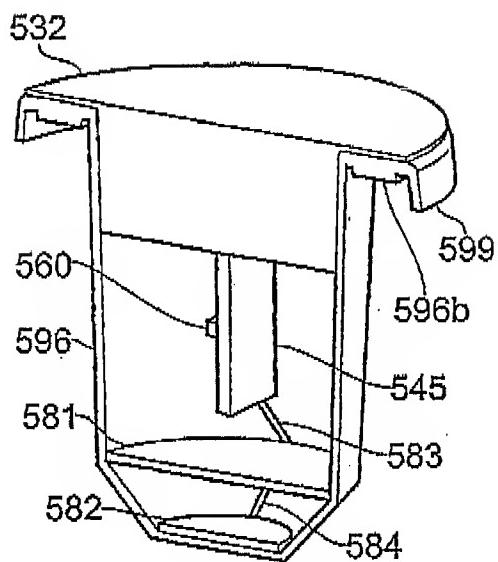


Fig. 8A

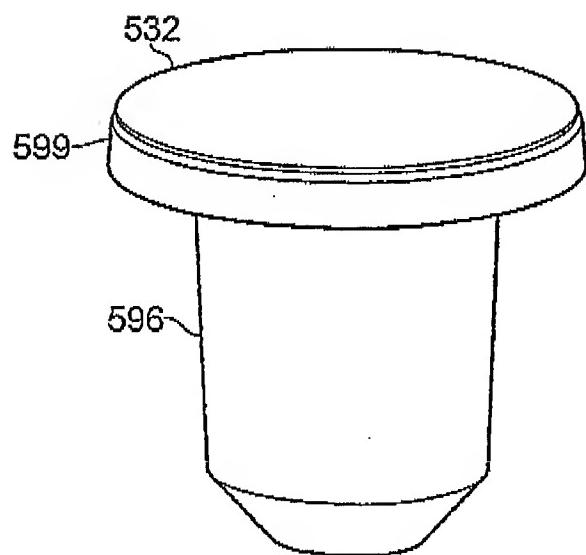


Fig. 8B

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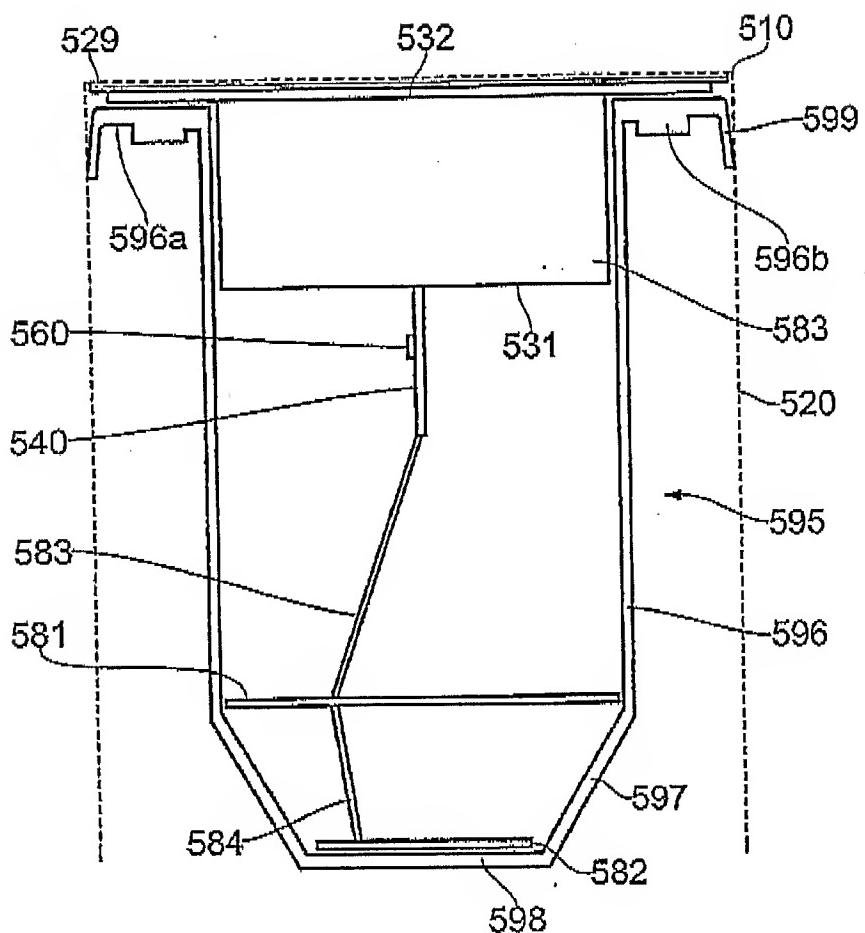


Fig. 9

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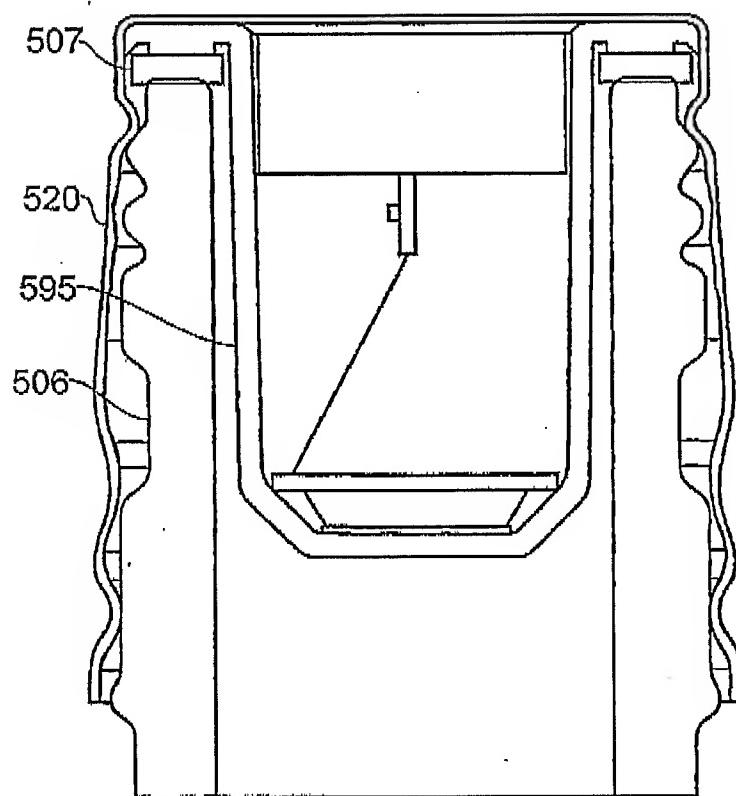


Fig. 10

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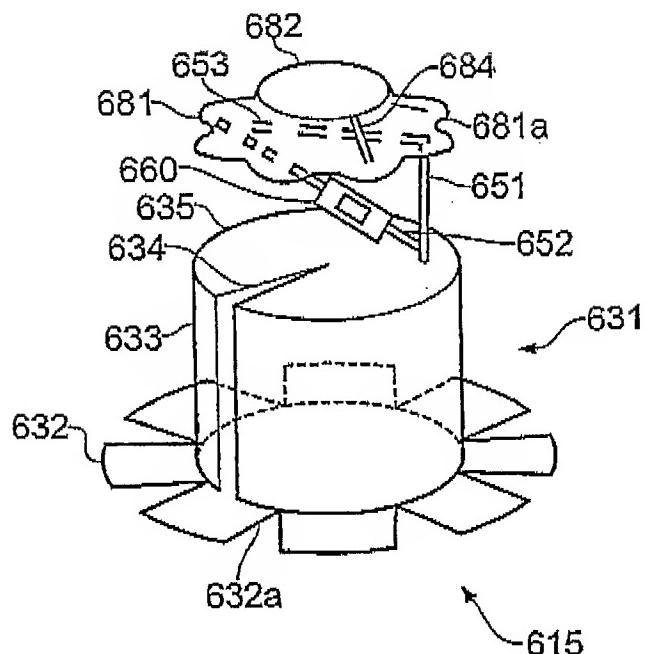


Fig. 11A

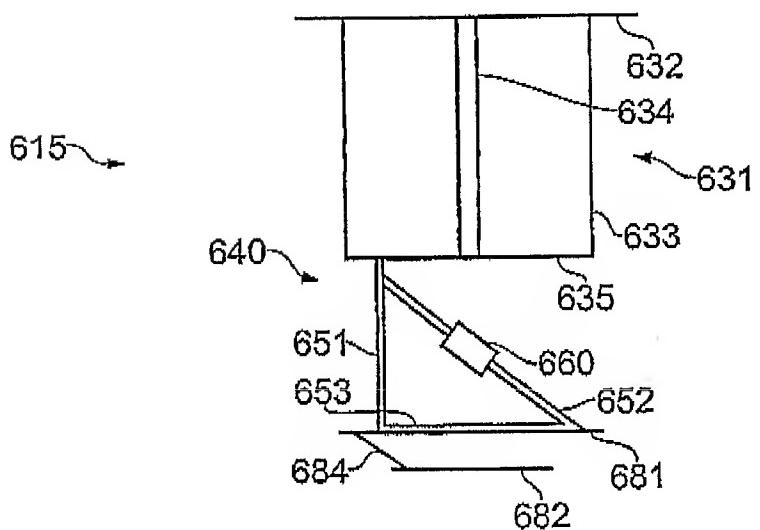


Fig. 11B

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PCT/GB2007/001473

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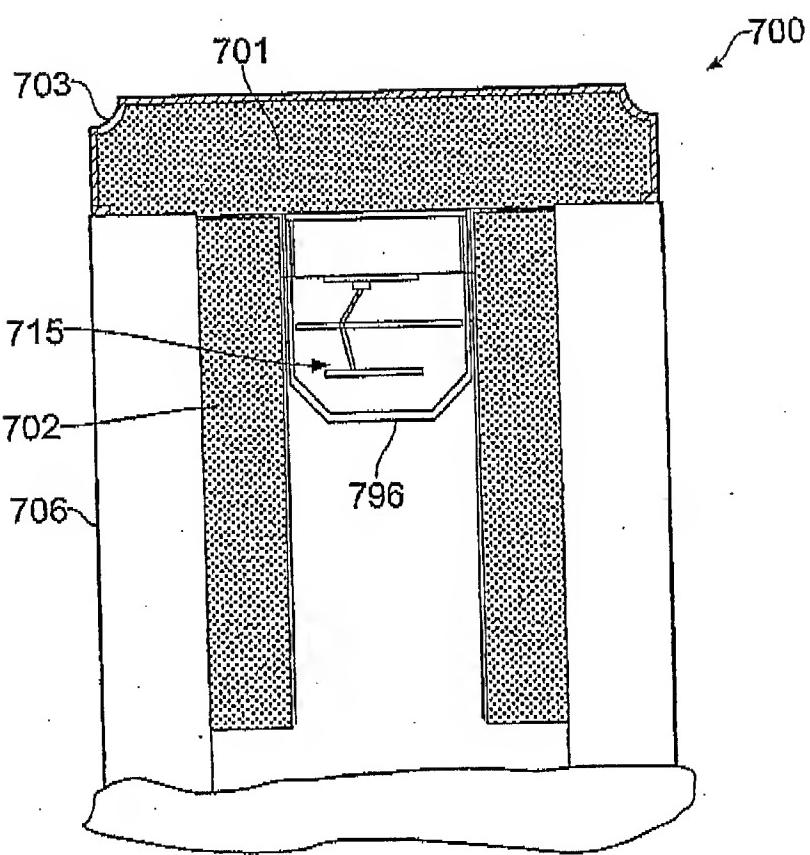


Fig. 12

**A. CLASSIFICATION OF SUBJECT MATTER**  
INV. G06K19/077

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)  
G06K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, INSPEC

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 619 243 A1 (LYONNAISE BOUCHAGE [FR]) 12 October 1994 (1994-10-12) cited in the application column 3, line 3 - line 11; figure 2 column 4, line 5 - line 6	1
A	WO 2005/024745 A (CLAESSENS FRANCES M [GB], KIPP TIMO W [GB]) 17 March 2005 (2005-03-17) cited in the application page 12, line 27 - page 13, line 20; figures 2,3 page 25, line 8 - line 16	2-12
X	WO 00/26878 A (SENSORMATIC ELECTRONICS CORP [US]) 11 May 2000 (2000-05-11) cited in the application claim 1; figure 1	1
A		2-12
		-/-

Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents:

- \*A\* document defining the general state of the art which is not considered to be of particular relevance
- \*E\* earlier document but published on or after the International filing date
- \*L\* document which may throw doubts on priority, claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- \*O\* document referring to an oral disclosure, use, exhibition or other means
- \*P\* document published prior to the International filing date but later than the priority date claimed

\*T\* later document published after the International filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance; the claimed Invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

\*Y\* document of particular relevance; the claimed Invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

\*&\* document member of the same patent family

Date of the actual completion of the International search

8 October 2007

Date of mailing of the International search report

19/10/2007

Name and mailing address of the ISA/  
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Fax: (+31-70) 340-3018

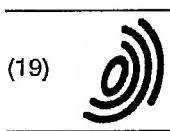
Authorized officer

Chiarizia, Salvatore

## C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2006/077062 A1 (ANDRECHAK GARY [US] ET AL) 13 April 2006 (2006-04-13) abstract	1

Patent document cited in search report	Publication date		Patent family member(s)		Publication date
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WO 0026878	A	11-05-2000	AU AU BR CA EP JP US	757755 B2 1206900 A 9914819 A 2346052 A1 1200947 A1 2002529320 T 6137413 A	06-03-2003 22-05-2000 10-07-2001 11-05-2000 02-05-2002 10-09-2002 24-10-2000
US 2006077062	A1	13-04-2006	NONE		



(19)

Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 619 243 B1

(12)

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(22) Date de dépôt: 31.03.1994

(54) Dispositif antivol pour récipients munis d'un moyen de bouchage ou de surbouchage

Vorrichtung zur Diebstahlsicherung für mit einer Kappe oder einer Überkappe versehene Behälter  
Anti-theft device for containers provided with a capping or an overcapping means

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(30) Priorité: 08.04.1993 FR 9304408

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(43) Date de publication de la demande:  
12.10.1994 Bulletin 1994/41

(56) Documents cités:  
EP-A- 0 233 077 WO-A-85/02285  
DE-U- 8 908 576 FR-A- 2 605 747  
FR-A- 2 614 109 US-A- 4 075 618

(73) Titulaire: Manufacture Lyonnaise de Bouchage  
Société Anonyme  
F-69740 Genas (FR)

EP 0 619 243 B1

Il est rappelé que: Dans un délai de neuf mois à compter de la date de publication de la mention de la délivrance du brevet européen, toute personne peut faire opposition au brevet européen délivré, auprès de l'Office européen des brevets. L'opposition doit être formée par écrit et motivée. Elle n'est réputée formée qu'après paiement de la taxe d'opposition. (Art. 99(1) Convention sur le brevet européen).

**Description**

La présente invention concerne un dispositif antivol pour récipients munis d'un moyen de bouchage ou de surbouchage, tels que notamment les bouteilles, et encore plus particulièrement les bouteilles dont le contenu possède une valeur relativement élevée : vins, liqueurs, autres boissons alcoolisées...

Le problème du vol se pose de façon spécifique dans les magasins de vente en libre-service. Ce problème est souvent résolu par la pose, sur les articles proposés à la vente, de dispositifs détectables par des moyens appropriés, au passage des caisses de paiement ou à la sortie du magasin.

Dans le cas de bouteilles vendues à l'unité, la forme même de ces articles pose un problème particulier pour la mise en place de dispositifs détectables, à fonction de protection antivol. On a déjà proposé à cet effet des bagues ou étiquettes spéciales, mais de tels moyens possèdent un coût relativement important par rapport à la valeur de chaque article à protéger. De plus, ces moyens sont visibles extérieurement sur les récipients, donc peu discrets et inesthétiques.

La présente invention vise à éviter les inconvénients précédemment exposés, en fournissant un dispositif antivol économique et discret pour les récipients munis d'un moyen de bouchage ou de surbouchage.

A cet effet, le dispositif antivol selon l'invention comprend, pour chaque récipient, un moyen détectable par voie électrique et/ou magnétique et/ou électromagnétique, intégré au moyen de bouchage ou de surbouchage de ce récipient.

Ainsi, l'invention propose un dispositif antivol qui mettra judicieusement à profit les bouchons, ou autres moyens de bouchage ou surbouchage, des articles concernés, le dispositif se trouvant intégré au bouchon, notamment en étant inséré dans l'épaisseur de ce bouchon. On évite donc tout étiquetage spécial, qui doit être posé par le personnel des magasins pour un coût par article relativement élevé, l'invention permettant de réduire ce coût de moitié environ. De plus, le dispositif antivol selon l'invention est réellement invisible donc particulièrement discret, comparativement aux bagues actuellement apposées sur certaines bouteilles. Enfin, pour le produit embouteillé, le dispositif antivol selon l'invention peut, s'il émet un signal spécifique identifiant le produit, devenir un moyen de référencement, amenant une économie supplémentaire d'étiquettes et de temps (en remplaçant par exemple le code-barres habituel).

Le moyen détectable, intégré au moyen de bouchage ou de surbouchage, se présente avantageusement comme un micro-circuit électronique ou "puce", ou un circuit électrique imprimé, ou une "étiquette" avec code magnétique, ou un filament émetteur, ou encore un circuit ou composant de mêmes caractéristiques formé par une peinture, une encre ou un vernis, ces divers modes de réalisation étant caractérisés par leur faible épaisseur, permettant leur intégration au moyen

de bouchage ou de surbouchage, par application, pose ou projection, selon toute technique, sur une partie dudit moyen de bouchage ou de surbouchage.

Dans le cas d'un récipient tel que bouteille avec bouchon se composant d'une capsule coiffant un joint en forme de disque, le moyen détectable est, de préférence, inséré entre le fond de la capsule et la face supérieure du joint, ce qui le rend invisible tout en le plaçant à faible distance de la surface extérieure du bouchon.

Le moyen détectable peut être appliqué ou fixé sur le fond de la capsule, avant la mise en place du joint. En variante, ce moyen détectable est appliqué ou fixé sur la face supérieure du joint, avant introduction de ce dernier dans la capsule, ce qui conduit aussi à sa dissimulation à l'intérieur du bouchon.

Dans le cas d'un moyen détectable formé par dépôt ou projection d'une encre ou d'un vernis à propriétés électriques ou magnétiques adaptées, s'il s'agit d'une encre ou d'un vernis invisible à l'œil nu, le dépôt ou la projection peuvent aussi se faire sans inconvénient sur la face extérieure du bouchon ou de la capsule.

La détection des récipients éventuellement non présentés à la caissière s'effectue par électromagnétisme ou radiofréquence, comme cela est déjà largement pratiqué à l'heure actuelle, en imposant le passage des clients sous des portiques, ou entre des panneaux équipés pour la détection dudit moyen détectable. En cas de passage d'un fraudeur portant sur lui un récipient non présenté à la caissière, le dispositif de détection émet un signal d'alarme, sonore ou autre.

Pour les récipients normalement présentés à la caissière, ledit moyen détectable peut être neutralisé lors de l'encaissement, ceci également par électromagnétisme ou radiofréquence selon des techniques connues.

De toute façon, l'invention sera mieux comprise à l'aide de la description qui suit, en référence au dessin schématique annexé représentant, à titre d'exemples non limitatifs, quelques formes d'exécution de ce dispositif antivol pour récipients munis d'un moyen de bouchage ou de surbouchage :

Figure 1 est une vue d'ensemble, en perspective, une bouteille équipée d'un dispositif antivol conforme à la présente invention ;  
Figure 2 est une vue en coupe verticale de la partie supérieure d'une bouteille équipée d'un dispositif antivol selon une première forme de réalisation de l'invention ;  
Figure 3 est une vue similaire à figure 2, illustrant une variante ;  
Figure 4 est une vue de face du joint du bouchon de figure 3 ;  
Figure 5 est une vue similaire à figure 4, illustrant une autre variante ;  
Figure 6 est une vue similaire aux deux précédentes, illustrant une dernière variante.

Le dispositif antivol objet de l'invention est illustré

sur le dessin annexé, notamment aux figures 1 à 3, dans le cas de son application à une bouteille 1, pourvue d'un goulot 2 recevant un bouchon de fermeture 3. Ce dispositif antivol comporte, comme l'illustre de façon générale la figure 1, un moyen détectable 4 de faible épaisseur, qui est intégré dans le bouchon 3 de la bouteille 1, et qui est ainsi invisible depuis l'extérieur.

Comme le montre plus particulièrement la figure 2, le bouchon 3 est composé habituellement d'une capsule 5 et d'un joint 6. La capsule 5 comprend un fond circulaire 7, et une jupe latérale 8 appliquée contre le goulot 2 de la bouteille 1. Le joint 6, en forme de disque, se trouve emprisonné entre le fond 7 de la capsule 5 et le sommet du goulot 2.

Ainsi, le moyen détectable 4 est facilement logé entre le fond 7 de la capsule 5 et le joint 6. Plus particulièrement, dans le mode de réalisation de la figure 2, ce moyen détectable 4 se trouve fixé contre le fond 7 de la capsule 5, sa fixation étant réalisée avant la mise en place du joint 6.

En variante, comme l'illustre la figure 3, on peut adopter une disposition inverse et équivalente, selon laquelle le moyen détectable 4 se trouve fixé sur la face supérieure du joint 6, avant introduction de ce dernier dans la capsule 5.

La figure 4 est une vue de face du joint 6 de figure 3, sur lequel est appliqué et fixé le moyen détectable 4 ici réalisé sous la forme d'une "étiquette", portant un code magnétique identifiable par un détecteur approprié.

Comme le montre la figure 5, le moyen détectable est aussi réalisable sous la forme d'un micro-circuit électronique ou "puce" 9, ici fixé sur le joint 6.

Le moyen détectable est encore réalisable, comme l'illustre la figure 6, sous la forme d'un simple filament émetteur 10, de forme appropriée, ici aussi fixé sur le joint 6.

Bien entendu, ces derniers moyens détectables 9 et 10 peuvent être fixés sur le fond 7 de la capsule 5, au lieu du joint 6.

D'une manière non illustrée par le dessin, le moyen détectable est encore réalisable par dépôt ou projection d'une peinture, d'une encré ou d'un vernis, ayant par sa nature et/ou sa configuration les caractéristiques d'un circuit ou d'un organe détectable par voie électromagnétique ou par radiofréquence.

Ainsi, lors du passage aux caisses d'un supermarché, le client qui remet normalement la bouteille 1 à la caissière verra le moyen détectable 4, 9 ou 10 neutralisé par la caissière, au moyen d'une pince magnétique appliquée au-dessus du bouchon 3. Par contre, le fraudeur qui ne remettrait pas la bouteille 1 à la caissière est obligé de passer avec cette bouteille 1 sous un portique, ou entre des panneaux détecteurs, sensibles au passage du moyen détectable 4, 9 ou 10. Un signal sonore ou autre, permettant de repérer le fraudeur, peut ainsi être déclenché.

Le dispositif antivol selon l'invention peut être appliqué à des bouchons 3 en toutes matières, telles que

métal, matière synthétique ou matériaux composites, dans la mesure où ces matières ne perturbent pas la détection.

Comme il va de soi, et comme il ressort de ce qui précède, l'invention ne se limite pas aux seules formes d'exécution de ce dispositif antivol pour récipients munis d'un moyen de bouchage ou de surbouchage qui ont été décrites ci-dessus, à titre d'exemples ; elle embrasse, au contraire, toutes les variantes de réalisation respectant le même principe, ainsi que toutes les variantes d'application, le dispositif antivol selon l'invention étant applicable à des récipients autres que des bouteilles, par exemple à des flacons, à des bidons, à des bocaux ou à des pots, et ce dispositif étant aussi adaptable à des moyens de bouchage ou de surbouchage très divers, autres que des bouchons, par exemple à des opercules obturant des pots.

## Revendications

1. Dispositif antivol pour récipients munis d'un moyen de bouchage ou de surbouchage, caractérisé en ce qu'il comprend, pour chaque récipient (1), un moyen (4;9;10) détectable par voie électrique et/ou magnétique et/ou électromagnétique, intégré au moyen de bouchage ou de surbouchage (3) de ce récipient (1).
2. Dispositif antivol pour récipients selon la revendication 1, caractérisé en ce que le moyen détectable, intégré au moyen de bouchage ou de surbouchage (3), est un micro-circuit électronique ou "puce" (9).
3. Dispositif antivol pour récipients selon la revendication 1, caractérisé en ce que le moyen détectable, intégré au moyen de bouchage ou de surbouchage (3), est un circuit électrique imprimé.
4. Dispositif antivol pour récipients selon la revendication 1, caractérisé en ce que le moyen détectable, intégré au moyen de bouchage ou de surbouchage (3), est une "étiquette" avec code magnétique (4).
5. Dispositif antivol pour récipients selon la revendication 1, caractérisé en ce que le moyen détectable, intégré au moyen de bouchage ou de surbouchage (3), est un filament émetteur (10).
6. Dispositif antivol pour récipients selon la revendication 1, caractérisé en ce que le moyen détectable, intégré au moyen de bouchage ou de surbouchage (3), est formé par une peinture, une encré ou un vernis déposé ou projeté sur une partie du moyen de bouchage ou de surbouchage (3).
7. Dispositif antivol pour récipients avec bouchon (3) composé d'une capsule (5) coiffant un joint (6) en forme de disque, selon l'une quelconque des revendications 1 à 6, caractérisé en ce que le moyen

- détectable (4;9;10) est inséré entre le fond (7) de la capsule (5) et la face supérieure du joint (6).
8. Dispositif antivol pour récipients selon la revendication 7, caractérisé en ce que le moyen détectable (4;9;10) est appliqué ou fixé sur le fond (7) de la capsule (5).
9. Dispositif antivol pour récipients selon la revendication 7, caractérisé en ce que le moyen détectable (4;9;10) est appliqué ou fixé sur la face supérieure du joint (6).
10. Dispositif antivol pour récipients selon la revendication 6, caractérisé en ce que, dans le cas d'un moyen détectable formé par dépôt ou projection d'une encre ou d'un vernis invisible, ce moyen détectable est déposé ou projeté sur la face extérieure du bouchon (3) ou de la capsule (5).
11. Dispositif antivol pour récipients selon l'une quelconque des revendications 1 à 10, caractérisé en ce que le moyen détectable (4;9;10), intégré au moyen de bouchage ou de surbouchage (3), est utilisé en outre comme moyen de référencement pour le produit contenu dans le récipient (1).
- 5      formed from paint, ink or varnish deposited or sprayed on a part of the capping or overcapping means (3).
- 10     7. Anti-theft device for containers with a cap (3) consisting of a closure (5) covering a seal (6) in the form of a disc, according to any one of Claims 1 to 6, characterised in that the detectable means (4; 9; 10) is inserted between the base (7) of the closure (5) and the top face of the joint (6).
- 15     8. Anti-theft device for containers according to Claim 7, characterised in that the detectable means (4; 9; 10) is applied or fixed to the base (7) of the closure (5).
- 20     9. Anti-theft device for containers according to Claim 7, characterised in that the detectable means (4; 9; 10) is applied or fixed to the top face of the seal (6).
- 25     10. Anti-theft device for containers according to Claim 6, characterised in that, in the case of a detectable means formed by the deposition or spraying of an invisible ink or varnish, this detectable means is deposited or sprayed onto the outer face of the cap (3) or of the closure (5).
- 30     11. Anti-theft device for containers according to any one of Claims 1 to 10, characterised in that the detectable means (4; 9; 10) integrated in the capping or overcapping means (3), is also used as a means of identifying the product contained in the container (1).

### Claims

1. Anti-theft device for containers provided with a capping or overcapping means, characterised in that it comprises, for each container (1), an electrically and/or magnetically and/or electromagnetically detectable means (4; 9; 10), integrated in the capping or overcapping means (3) of this container (1).
2. Anti-theft device for containers according to Claim 1, characterised in that the detectable means integrated in the capping or overcapping means (3) is an electronic microcircuit or "chip" (9).
3. Anti-theft device for containers according to Claim 1, characterised in that the detectable means integrated in the capping or overcapping means (3) is a printed electric circuit.
4. Anti-theft device for containers according to Claim 1, characterised in that the detectable means integrated in the capping or overcapping means (3) is a "label" with a magnetic code (4).
5. Anti-theft device for containers according to Claim 1, characterised in that the detectable means integrated in the capping or overcapping means (3) is an emitting filament (10).
6. Anti-theft device for containers according to Claim 1, characterised in that the detectable means integrated in the capping or overcapping means (3) is
- 35     Patentansprüche
1. Vorrichtung zur Diebstahlsicherung für mit einer Kappe oder einer Überkappe versehene Behälter, dadurch gekennzeichnet, daß sie für jeden Behälter (1) ein auf elektrischem und/oder magnetischem und/oder elektromagnetischem Wege abtastbares Mittel (4; 9; 10) beinhaltet, das in der Kappe oder der Überkappe (3) des Behälters (1) integriert ist.
- 40     2. Vorrichtung zur Diebstahlsicherung für Behälter gemäß Anspruch 1, dadurch gekennzeichnet, daß das abtastbare, in die Kappe oder die Überkappe integrierte Mittel ein elektronischer Schaltkreis oder ein "IC" (9) ist.
- 45     3. Vorrichtung zur Diebstahlsicherung für Behälter gemäß Anspruch 1, dadurch gekennzeichnet, daß das in die Kappe oder die Überkappe integrierte abtastbare Mittel ein gedruckter elektronischer Schaltkreis ist.
- 50     4. Vorrichtung zur Diebstahlsicherung für Behälter gemäß Anspruch 1, dadurch gekennzeichnet,

- daß das in die Kappe oder die Überkappe integrierte abtastbare Mittel ein "Etikett" mit magnetischem Code ist (4).
5. Vorrichtung zur Diebstahlsicherung für Behälter gemäß Anspruch 1, dadurch gekennzeichnet, daß das in die Kappe oder die Überkappe integrierte abtastbare Mittel ein Sendefaden (10) ist.
  6. Vorrichtung zur Diebstahlsicherung für Behälter gemäß Anspruch 1, dadurch gekennzeichnet, daß das in die Kappe oder die Überkappe integrierte abtastbare Mittel durch eine bildliche Darstellung, eine Schwärzung oder einen Lack, der auf einen Bereich der Kappe oder der Überkappe aufgebracht oder aufgespritzt wird, gebildet ist. 15
  7. Vorrichtung zur Diebstahlsicherung für Behälter mit einer Kappe (3), die eine Dichtung (6) in Form einer Scheibe überdeckende Kapsel (5) beinhaltet, nach einem der Ansprüche 1 - 6, dadurch gekennzeichnet, daß das abtastbare Mittel (4; 9; 10) zwischen der Unterseite (7) der Kapsel (5) und der Oberseite der Dichtung (6) angeordnet ist. 20
  8. Vorrichtung zur Diebstahlsicherung für Behälter nach Anspruch 7, dadurch gekennzeichnet, daß das abtastbare Mittel (4; 9; 10) auf der Unterseite (7) der Kapsel (5) angebracht oder befestigt ist. 25
  9. Vorrichtung zur Diebstahlsicherung für Behälter gemäß Anspruch 7, dadurch gekennzeichnet, daß das abtastbare Mittel (4; 9; 10) auf der Oberseite der Dichtung (6) angebracht oder befestigt ist. 30
  10. Vorrichtung zur Diebstahlsicherung für Behälter nach Anspruch 6, dadurch gekennzeichnet, daß in dem Fall, in dem das abtastbare Mittel durch Aufbringen oder Aufspritzen einer Schwärzung oder eines unsichtbaren Lackes gebildet ist, dieses abtastbare Mittel auf der Außenseite der Kappe (3) oder der Kapsel (5) aufgebracht oder aufgespritzt ist. 35
  11. Vorrichtung zur Diebstahlsicherung für Behälter nach einem der Ansprüche 1 - 10, dadurch gekennzeichnet, daß das abtastbare Mittel (4; 9; 10), das in die Kappe oder die Überkappe (3) integriert ist, darüber hinaus als Referenzmittel für das im Behälter (1) enthaltene Produkt benutzt wird. 40
  - 50

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FIG 1

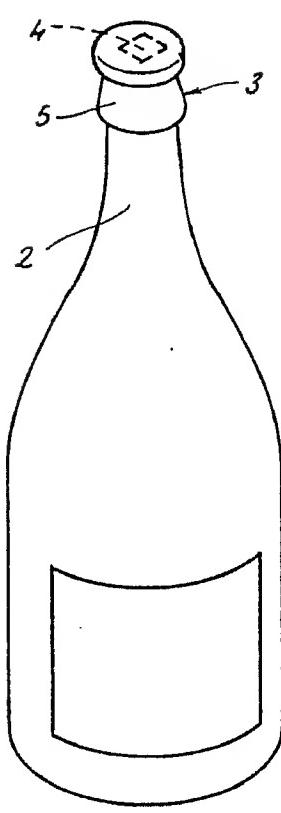


FIG 2

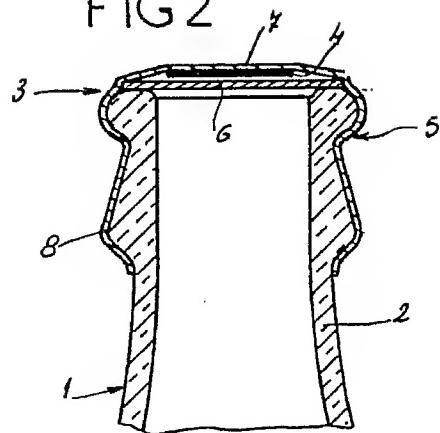


FIG 3

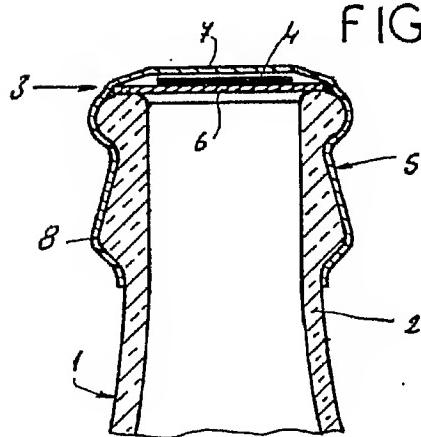


FIG 4

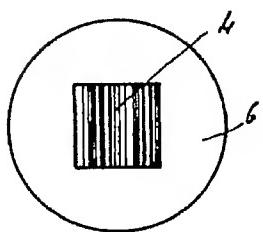


FIG 5

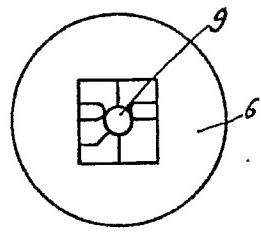
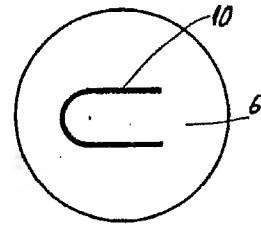


FIG 6



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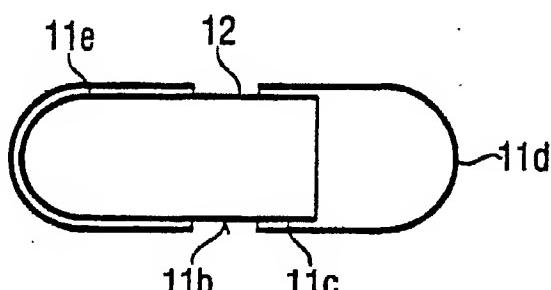
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(54) Title: WATER SOLUBLE PACKAGING



(57) Abstract: The invention is concerned with controlled release packaging comprising packaging material which is at least partially or substantially completely dispersible or dissolvable in an effective amount of a water-containing substance and which is adapted to comprise, contain or enclose one or more substances wherein the packaging is adapted for release of comprised, contained or enclosed substances in response to a predetermined stimulus in predetermined manner to a desired locus with substantially simultaneous or subsequent partial or complete dispersal or dissolving thereof.

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## WATER SOLUBLE PACKAGING

The present invention relates to improved packaging which is at least partially or substantially completely dissolvable in water for controlled release of substances, methods for controlled release using the packaging, methods for the production 5 thereof, the use for release of a wide range of substances and novel products comprising the packaging.

Water soluble packaging is known in the literature for dispensing substances, with partial or complete dissolution thereof leaving little or no residue. Such packaging materials are used in isolation as self supporting packaging or are used in 10 combination with non soluble dispensers. These packaging materials release contained substances such as, hazardous substances, fungicides etc., concentrates such as detergents and the like on dissolution in water.

The advantages of such packaging is readily apparent, by way of reducing splash or spillage risk with hazardous substances during dilution, containing hazardous 15 powder substances prior to dissolution and preventing the risk of inhalation, avoiding the need for safe disposal of used packaging material for hazardous substances and the like, providing pre-metered dosing in prescribed quantities as individual packages, convenient handling, minimising wastage of substance dregs, package disposal and the like.

20 In some uses it is acceptable to have an amount of residue remaining for example as a surface film, although this is undesirable in certain uses.

With larger quantities of substance to be released, there is a risk of fracture or failure of the packaging. In EP-A-763479 (Rhone Poulenc Agric Limited) is disclosed such packaging in which the liquid substance to be released contains an 25 additive to increase its viscosity. Such solutions to the problem are however not entirely satisfactory and therefore there is a need for water soluble packaging which is sufficiently resilient to reliably contain a substance until the desired point of dispensing.

Encapsulation technology using water soluble capsule material is known in the pharmaceutical industry for delivery of pharmaceuticals, vitamins, supplements and the like by oral ingestion using gelatin, cellulose and derivatives as encapsulating materials. Gelatin, cellulose and derivatives and the like are substantially completely dissolvable in water and are approved capsule material for food and drug use. These capsules are intended for dissolving over a range of periods under different conditions within the body.

Dissolvable gelatin sachets are known in the literature for containing and preserving powdered flavouring, colouring and other substantially dried food components as part of pre-packed food such as dehydrated noodles in a pot into which hot water is added in order to prepare the food for consumption. Failure or fracture of such sachets can lead to deterioration of contents.

There is a continual need for improved packaging materials and configurations to potentially extend the useful applications and uses of a number of water soluble packaging materials.

It is an object of the present invention to provide packaging which is at least partially or substantially completely dispersible or dissolvable in water-containing substances for controlled release of a wide range of diverse solid and fluid substances in a wide range of diverse forms, whereby the packaging is versatile and easily manipulated to the intended substance or use in desired manner.

We have now surprisingly found that packaging comprising materials which are at least partially or substantially completely dissolvable in water-containing materials may be adapted according to the present invention to provide novel combinations of formulation and configuration suited for release of contained or enclosed substances in manner to meet the objective as hereinbefore defined.

In its broadest aspect there is provided according to the present invention controlled release packaging comprising packaging material which is at least partially or substantially completely dispersible or dissolvable in an effective

amount of a water-containing substance and which is adapted to comprise, contain or enclose one or more substances wherein the packaging is adapted for release of comprised, contained or enclosed substances in response to a predetermined stimulus in predetermined manner to a desired locus with substantially 5 simultaneous or subsequent partial or complete dispersal or dissolving thereof.

The substance to be released may be in the form of solid or liquid and is preferably selected from powders, granules, crystals, microcapsules, monoliths, suspensions, dispersions, concentrates, gels, thixotropes, non-aqueous solutions and the like and mixtures thereof. Solid substances may be in a desired grade or range of grades.

10 For certain applications it is desired to provide substance in fine and coarse form for prolonged effect. It is an advantage of the present invention that individual doses of substance contain the desired range of solid grade and are not subject to the disadvantages of „settling“ which result from transport and storage of volumes of the substance, or with combinations of substances having different particle 15 grades.

Substance to be released may be integral with the water-dispersible or soluble packaging material which may be in the form of a solid or hollow mass, a hollow container or enclosure of a separate container and/or contained or enclosed within the hollow mass, container or enclosure.

20 The packaging is characterised by novel selection of features or combinations of features of packaging conformation and/or configuration, packaging material formulation and the like, in manner to provide novel selection of properties or combinations of properties. More specifically the packaging is characterised by novel selection of features or combinations relating to handling and storage, for 25 example in manner to resist influences leading to premature release by means of package formulation conformation or configuration including sealing and reinforcing thereof; nature of comprised, contained or enclosed substances which may be viscous or non viscous fluid, non compactable flowable powder and other forms of substance which are not easily manipulated or controlled; nature and/or

timing of release for example for releasing one or a combination of substances in simultaneous or subsequent fashion, or for releasing substances in manner to contact other substances in the desired locus for improved substance performance or quality for the intended use; nature of predetermined release stimulus and the  
5 like, for example being the water-containing substance itself, a physical or chemical stimulus in the desired locus or a combination thereof. Features and properties may derive from the water-soluble or dispersible packaging material and/or from additional materials or substances formulated, conformed or configured with the water-dispersible or soluble packaging material, or from the  
10 conformation or configuration of the packaging, and are selected according to the intended use.

The packaging may consist substantially entirely of water-dispersible or soluble packaging material or combinations thereof as hereinbefore defined or may comprise additional materials as hereinbefore defined which are at least partially  
15 dispersible or dissolvable or otherwise. Preferably the packaging is substantially completely dissolvable as hereinbefore defined.

Reference herein to a water-containing substance is to any solid, semi-solid, liquid or gaseous (vapour) fluid which comprises water in effective dispersing or dissolving amount. Water may be chemically or physically releasably bound or  
20 may be freely available and may be gathered or accumulated from the substance or readily and instantly taken up by the material. Preferably a water-containing substance as hereinbefore defined comprises liquid- or vapour-form water, or aqueous solutions or vapour mixtures thereof with liquids or vapours such as alcohols and the like, or comprises solids or semi-solids having bound or available  
25 water. Water may be accumulated by the water-dispersible or soluble packaging material which at least partially disperses or dissolves to release the comprised, contained or enclosed substance into the accumulated water and the dispersed or dissolved packaging material may be retained in the locus or dispersed therefrom in the course of the intended use or otherwise.

Reference herein to a predetermined stimulus is to any stimulus causing release of contained or enclosed substance. The stimulus may comprise chemical or physical stimulus for dissolving or dispersing, transforming by precipitation or morphology change, fracturing, rupturing or otherwise rendering permeable the packaging or a part thereof to release contained or enclosed substance.

The stimulus may be the same as or different to the water-containing substance which serves to disperse or dissolve. Packaging materials may be dispersible or soluble in hot or cold water-containing substance and/or may release substance by dissolution or by other physical or chemical means such as exposure to heat, acid or alkali, solvents and solvent mixtures, oxidising conditions, radiant energy including UV, microwave and the like or biological degradants.

Reference herein to a locus is to any place, area or the like into or at which it is desired to release the substance. The locus may be the same as or may be different to but connecting with a locus at which the substance is to have a desired effect.

15 Preferably the packaging comprises a primary and secondary component in terms of conformation, configuration or formulation adapted to dissolve and release the substance to the desired locus and to control stimulus or external influences to which the release element is subjected in manner to provide release with pre-determined timing and in pre-determined manner.

20 The packaging may comprise any suitable material which is capable of being formed into packaging, and which is dispersible or dissolvable in water-containing substance to leave only a part thereof as residue or to leave substantially no residue.

Preferably the water-dispersible or soluble packaging material comprises a natural or synthetic polymer or mixtures thereof selected from:

25 Polyvinyl alcohol (PVA), polyethyleneoxide, chemically modified cellulose or cellulose ethers and other cellulose derivatives, modified starches, polyvinylpyrrolidone, polyacrylamide or gelatine or derivative thereof. Chemically modified cellulose and cellulose ethers include alkyl- and/or hydroxyalkyl

- substituted cellulose or cellulose ether with 1 to 4 carbon atoms in the alkyl chain preferably methyl cellulose (ether), hydroxyethyl cellulose, hydroxyethylmethyl cellulose, hydroxyethylethyl cellulose, hydroxypropyl cellulose (having the chemical name cellulose hydroxypropylether), hydroxypropylmethyl cellulose 5 (HPMC, having the chemical name cellulose hydroxypropylmethylether), hydroxybutylmethyl cellulose and the like. Modified starches include destructureised starch, cross-linked granular starches, chemically modified starches including alkyl substituted starches, amino starches and oxidised starches, dextrin and maltodextrins.
- 10 Water-dispersible or soluble packaging material is suitably selected or adapted according to independent mechanical properties or combinations thereof („soft“ or „hard“ and/or self-supporting or non self-supporting, resilient to premature fracture or otherwise and the like) and/or independent chemical properties and combinations thereof (slow or rapid, complete or partial dissolving, responsive to 15 desired release stimulus and the like), requirements of non-toxicity (for environment, human or animal health or food-related uses and the like). For example different formulations and combinations of water dispersible or soluble packaging material(s) may be provided having desired combination of properties by varying or selecting the moisture content, pH, moisture retention, swelling 20 properties, gel strength, gel point, viscosity, concentration, reacting substituent groups (cross-linking) and sensitivity to a number of external stimuli such as temperature, pH, solvents and solvent mixtures, oxidising conditions, radiant energy such as UV or microwave, biological degradation by moulds and bacteria and the like. Formulations and formulation techniques are known for example as 25 disclosed in Hard Capsules, ed. Ridgeway, WO 98/27151 (Warner Lambert) the contents of which are incorporated herein by reference.

Preferred packaging materials include gelatin, starch or cellulose or derivatives and mixtures thereof which are substantially completely soluble in water. Natural or synthetic gelatin and HPMC are found to have particularly useful properties.

The packaging of the present invention may be of any desired conformation and configuration suited to contain or enclose a solid or fluid substance as hereinbefore defined. Preferably the packaging comprises packaging material in the form of solid or hollow masses, hollow containers or closures such as capsules, bags, wallets or sachets, spherical, pyramidal, elongate, annular or conical bags and the like or closures such as membranes, partitions, caps, lids and the like. The conformation or configuration may be selected according to control requirements, storage requirements (stackable or able to be stored in space efficient manner i.e. cubes), use (adapted to be configured to locate in or in association with a support means of an environment), dispensable (adapted to be releaseably attached to a dispensing line, hook, rack or the like for convenient access), and the like.

The packaging as hereinbefore defined may provide a primary structure or region of packaging material for strengthening, reinforcing, retaining package integrity during release or other such purpose, such as a skeleton, frame work, fibres, mesh, ribbing, webbing, seal or the like integral with or at least partially (co)-continuous with a secondary structure of substantially continuous packaging material in desired configuration.

Alternatively or additionally the packaging may comprise a primary containing or enclosing shell or layer in the form of a sheath, tablet or the like containing or enclosing a secondary containing or enclosing layer of packaging material.

Alternatively or additionally the packaging may comprise primary packaging material having secondary points of weakness in the form of packaging material formulated for rapid or easy dissolving or fracture, or of flaws or water entraining features such as moulding or embossing in the form of non-penetrating perforations, tear-off strip lines and the like.

Primary and secondary structures and layers and point of weakness packaging material as hereinbefore defined may be comprised of the same or different packaging materials and combinations thereof as hereinbefore defined, having

same or different properties such as thickness and the like. Different packaging materials include at least one packaging material being a water-dispersible or soluble packaging material which may be the same as or different to at least one being a packaging material adapted for release as hereinbefore defined.

- 5 Alternatively or additionally the packaging may comprise means for locating or positioning within the locus into which a contained substance is to be released in manner to secure it at the optimum position for storing, or for timing or activating the release stimulus for example for the operation of dissolving water in the locus on the release element, or to maintain the packaging in desired position in manner  
10 10 to withstand influences such as impact force during handling and storage and the like.

Such locating means may comprise packaging material as hereinbefore defined adapted to engage a suitable support, for example may comprise an elongate substantially resilient or flexible portion adapted to be tied or hooked onto or  
15 located around a suitable projection or received within a recess of an effective support in the environment in which the packaging is contained, or may comprise resiliently deformable projections extending in opposing directions from the containing or enclosing packaging material as hereinbefore defined and adapted to be deformed to locate between opposing retaining means, surfaces and the like of  
20 an effective support means and be retained by resilience.

Alternatively or additionally the packaging comprises a specific configuration, conformation or formulation adapted to absorb or dispel external influences to which the packaging may be subjected and which may lead to premature release of contained or enclosed substance. For example the packaging may confer a  
25 protective shape on contained or enclosed fluid substance to minimise turbulence in storage and handling and/or may comprise packaging material of thickness, strength, resilience, flexibility and the like adapted to withstand external influences.

Packaging as hereinbefore defined may be adapted to be self-supporting.

Alternatively or additionally packaging as hereinbefore defined comprises means to aid rapid release of contained or enclosed substance. In this case the packaging comprises means to enhance the response thereof to release stimulus, by means of formulation or of additional components incorporated in or contained within the

5 packaging. Preferably response enhancing means are adapted to cause release by expanding on contact with water-containing substances, for example comprise swelling or expanding agents (maize starch), effervescent agents (sodium bicarbonate and citric acid), disintegrants (Explotab<sup>TM</sup> available from Penwest Pharmaceuticals or Primojel<sup>TM</sup> available from Avebe), dispersing agents (sodium

10 starch glycolate, sodium alginate, carboxymethylcellulose sodium salt and the like) or contained gases, such as air at a positive overpressure and the like, stimulus sensitising agents, for example adapted to cause release on change of pH (change in degree of acid or alkali conditions or transition therebetween), change in temperature, subjecting to microwave, UV, solvents and solvent mixtures and the

15 like. Response enhancing means may be integral with packaging packaging material or contained in open or closed porosity therein to provide increased surface area and weak points as hereinbefore defined for release for example by dissolving action on contact with water, and to provide expansion of contained air on change of temperature, contact of effervescent agents with water, microwaves,

20 UV, solvents and solvent mixtures and the like.

In a further aspect of the invention there is provided a method for the production of packaging as hereinbefore defined comprising forming packaging material as hereinbefore defined, and introducing one or more substances to be released as hereinbefore defined in manner to be comprised, contained or enclosed therein.

25 The manufacture may be carried out in a single operation or in desired sequence, depending on the intended use, substance to be released and form of packaging. The production method may be adapted to confer any features of formulation conformation, configuration and the like as hereinbefore defined.

The packaging may be formed by any known means for forming packaging materials as hereinbefore defined. Suitable means include any means for forming thermoplastic materials including residue free sealing one or more sheets, deforming one or more sheets by action of heat, solvents such as water, vacuum, 5 pressure and the like, extruding, shaping from solution or molten, for example by dipping or spraying onto a former, casting, embossing etc.

Substance(s) may be comprised, contained or enclosed within the packaging material by any known mechanical or chemical means including coforming the material and substance for example by fusing, blending or mixing into a molten 10 packaging material or a solution thereof, or sealing the packaging material about the substance(s) for example by softening the packaging material with water or a sensitising agent and self bonding to unsoftened or similarly softened packaging material, bonding or welding with solvent, glue and the like with or without application of heat or pressure. Preferably sealing is by techniques as disclosed in 15 patent publications in the name of Capsugel, specifically by contacting edges of packaging material with a melting point depression sealing fluid such as organic solvents for example alkyl substituted C<sub>1-5</sub> alcohols, water, a polymer solution or emulsion, a solution of a proteolytic enzyme producing a protein solution and the like, and applying thermal energy or the like to cause fusion, for example as 20 disclosed in relation to sealing of capsules in EP 0 152 517, EP 0 180 543, EP 0 116 744, and EP 0 116 743, the contents of which are incorporated herein by reference.

Points of weakness as hereinbefore defined may be provided in the packaging material by known means, for example embossing or moulding in the shape of the 25 packaging by necking and the like, by laser exposure or by pre-determined orientation or ordering of molecules within the chemical structure of the packaging.

Packaging as hereinbefore defined may be adapted to contain any desired quantity or volume of solid or liquid substance. Suitably the form and configuration of package is selected in part with reference to the desired volume and the nature of

- the substance to be contained or enclosed. Preferably the packaging is adapted to contain volumes of up to 10 litres of substance, for example in the range 0.1 ml up to 10 litres. Sub ranges for envisaged applications are preferably in the range of 0.1-5 ml, 5-50 ml, 50-500 ml, 500 ml – 5 litres and 5-10 litres. The packaging may
- 5 be adapted to have a volume substantially equal to that of the substance to be contained or greater than, e.g. up to three times the volume of the substance to be contained. The packaging volume may be selected according to ease of filling with substances. Suitably packaging is adapted to contain or enclose a single measure dose of one or more substances to be released.
- 10 Packaging may be adapted for clustering or may include a clustering element. Packaged substance may be clustered or aggregated by means of self adhesion, clustering attachment and the like in the case that a single measure exceeds the volume of substance which it is possible to contain or enclose or in the event that dosing is according to preference, or in the case that a selection of substances are to
- 15 be released simultaneously or in controlled sequence.

Packaging may comprise multiple compartments to segregate substances prior to release, or to provide sequential release.

- Packaging as hereinbefore defined may include an identification element, for example may be printed, moulded directly or indirectly for example by forming
- 20 flexible packaging material tightly about a contained substance having moulded protrusions, or embossed, laser-marked or the like to indicate the nature or origin of the contents, the mode of use, or to incorporate features of design. Printing is preferably by means of inks, dyes and the like which are completely dissolvable in water and which are adapted to be printed from non aqueous solutions or from
- 25 aqueous solutions.

Packaging as hereinbefore defined may be adapted to release substances substantially instantaneously on contact with water-containing substances as hereinbefore defined or in a controlled period of the order of minutes for immediate

use, quarter or a half hour period for example when it is desired to prime the packaging and evacuate the environment for release, hours or days for example where it is desired to prime the packaging for release during a period at which it is inconvenient or impossible to access the locus, or on response to a stimulus, for 5 example where it is desired to release substances in the event of natural or artificial water release, such as to coincide with rain or intentional or unintentional water release that is part of any chemical, mechanical, construction, manufacturing or the like process.

10 The packaging may be provided with additional agents adapted to enhance barrier properties for example to confer or enhance impermeability to oxygen and the like.

Packaging may be provided as one piece or as a plurality of pieces to be assembled at the time of filling with substrate, for example using conventional or modified capsule technology.

15 Packaging may be of any desired thickness, for example in the range 0.01 – 10 mm. It is a particular advantage of the present invention that minimal thickness for example in the range 0.01 – 1.0 mm may be attained with resilience to unintentional rupture, and that maximum thickness for example in the range 2 – 10 mm may be attained with desired precision of timing of release, by means of the selection of properties and features of formulations of packaging material, 20 conformations such as solid mass of packaging material or configurations such as structures and points of weakness of packaging of the invention as hereinbefore defined.

25 It should be appreciated that packaging material as hereinbefore defined may be adapted to maintain the integrity of the packaging prior to release of substances and to dissolve or disperse simultaneously with release or to subsequently disperse or dissolve over a prolonged period whilst still contained within the desired locus in contact with water-containing substance, during the period that the substance which has been released is effective, or thereafter.

Packaging may be provided within an additional film or container if it is important to keep the surface free from contamination.

Packaging or substance to be contained may comprise an additional indicating element, for example a component which indicates when dissolution is complete or 5 when the substance has achieved its desired effect. A colorant within the substance is detectable in the aqueous locus once dissolution is sufficiently advanced to release substance. The colorant may be associated with the substance whereby the colour disappears once substance is consumed in use.

In a further aspect of the invention there is provided a method for the controlled 10 release of a substance as hereinbefore defined from water-dispersible or soluble packaging material as hereinbefore defined comprising locating the packaging in a locus for intended release and subjecting to a release stimulus, for example contacting with water-containing substance as hereinbefore defined in effective dispersing or dissolving amount, for an effective period to activate release as 15 hereinbefore defined and release the substance into the locus, wherein the packaging is substantially simultaneously or subsequently at least partially or substantially completely dissolved in the water-containing substance. The packaging may comprise any features of conformation, configuration or formulation as hereinbefore defined.

20 The method provides advantages of reducing splash or spillage risk with hazardous substances during dilution, containing hazardous powder substances prior to dissolution and preventing the risk of inhalation, avoiding the need for safe disposal of used packaging material for hazardous substances and the like, providing pre-metered dosing in prescribed quantities as individual packages, 25 convenient handling, minimising wastage of substance dregs, package disposal and the like.

The method for controlled release as hereinbefore defined may be for any desired use for which it is intended to release a substance into an environment with any of the advantages as hereinbefore mentioned.

5 The packaging may be located directly in the desired locus or may be transported to the desired locus by suitable means, maintained out of contact with water-containing substance.

10 The packaging of the invention may be adapted to sink or float in water when added to a reservoir of water at the desired locus, or to initially sink or float and subsequently after a pre-determined interval float or sink prior to or at the time of release of contents, for example as indicating means or to maximise or minimise water content prior to release and the like.

15 The method may be for release of agrochemical substances including pest or plant growth control agents, plant disease control agents, soil improvement agents and the like. For example pest growth control agents include insecticides, miticides, rodenticides, molluscicides, slugicides, vermicides (nematocides, antihelminthics), soil fumigants, pest repellents and attractants such as pheromones etc., and biological control agents such as microorganisms, predators and natural products; plant growth control agents include herbicides, defoliants, desiccants, fruit drop and set controllers, rooting compounds, sprouting inhibitors, growth stimulants and retardants, moss and lichen controllers and plant genetic controllers or agents; plant disease control agents include fungicides, viricides, timber preservatives and bactericides; and soil improvements agents include fertilisers, trace metal additives, bacterial action control stimulants and soil consolidation agents.

20

25 The method may be for farming, greenhouse, horticultural, forestry and like applications on industrial or domestic scale by means of spraying, dusting, drilling and like techniques.

The advantages of the method include advantages as hereinabove defined and may include further advantages of safe handling including reduced risk of

contamination or carry over and no skin contact with active substance, convenience and ease of use, without measuring, decanting or re-sealing of part used sachets, dispensing with the need to dispose of contaminated packaging, precise dose control, avoiding user exposure to dust particles, providing solubility in cold water,  
5 providing greater flexibility in selection of dose amounts and with commercially available granules, reducing the risk of product deterioration once opened, optimising particle size for dissolution and use of minimal packaging. Further advantages include non clogging with spray nozzles and the like, no need for using a stirrer, no residue remaining, leak proof robust packaging and low cost per dose  
10 per unit area.

The method is also suited for release of environmental treatment agents such as water purification agents, disinfectants, waste treatment agents and the like, including control agents for water borne viruses, bacterium, organisms and insects which carry disease, natural and industrial contaminants including water borne  
15 plant growth control agents, soil run off dispersant agents, cooling and recycled water neutralising agents and the like. Advantages are as given above for agricultural use and include advantages of employing approved substances for use in purifying drinking water, and providing high quality of water which is not contaminated by particles or undissolved solid packaging material or residue, and  
20 speed of purifying action. Substances may be released into water or the desired locus in desired concentration suited for the desired effect, for example in lower amounts to render safe for consumption or in higher amounts to create a solution for application to an object or locus to be purified, disinfected or treated.

The method may be used for handling safe-to-the-point-of-use substances, for  
25 example hazardous substances including caustics, chemical reagents, drain clearing substances and the like which may be used in diluted form, which are relatively safe although unpleasant in powdered, non-aqueous or concentrate form but which become hazardous in solution. In this case a unit dose packaging may be provided which is safe to handle and which ensures correct dilution, and safety to the point

of use. This may provide advantages as above defined in addition to further advantages such as eliminating the need to transport bulk substances in hazardous diluted form, by providing a means for the safe dilution by the end user.

The method may be used for releasing detergents and their components in the form  
5 of solids or liquids such as concentrates, including domestic and industrial detergents for cleaning premises, objects and clothing and for personal hygiene using any known detergents or cleaning agents. The advantages include those given above, and additionally include aesthetic advantages by which the packaging leaves no deposit on the hands and is more pleasant to handle than powders or  
10 tablets, is structurally of high integrity preventing break up or spillage risk of the substance, has a reduced risk of product deterioration once a primary pack is opened and associated extended shelf life, has potentially more efficient and effective delivery of key ingredients, is easier to manufacture, formulate and use and gives a reduced risk of concentrate damage to clothes, skin and other articles,  
15 and renders optional the use of bags or devices from which to release the substance, additionally having the advantages of minimising the required amount of softening agents, bleaches, brighteners, dispersants, effervescent and other solubilising agents including phosphates. These components typically otherwise deteriorate with time or may be poorly distributed throughout the detergent, enabling dosing of  
20 multi-function substances in a single dose or sequential dosing in a single package for example having one substance embedded or enclosed within a further substance within the packaging, minimising volume to weight ratio and the like.

The method may also be used to release food components including flavours and fragrances in the form of dried or powdered solids, liquids and volatiles, texturising  
25 agents, colorants, moisture absorbers such as rice, corn flour, salt and the packaging material itself, oils and fats, dried dairy products and other food products which deteriorate in the presence of oxygen, seasoning and herbs and the like. The method for releasing food substances has advantages as indicated above and additional advantages in terms of precise dose control providing sizes linked to

standard culinary measures for example, separation of ingredients without using packs that need to be opened by the user, for example in instant food packs, environmentally friendly avoiding non edible secondary packaging, microwaveable, no risk of contamination with secondary packaging fragments, 5 clean and easy handling, edible packaging, no susceptible residue in hot water, sealing from air, preserving freshness and shelf life, taste and smell masking until required, for example to avoid contaminating other food components or the like, preservation of vitamins, colour, purity of flavour and the like. In a particular advantage packaging may be used to minimise deterioration of substances due to 10 contact in storage by separating and simultaneously may provide for improved dispersibility and contact on release by positioning food components in manner for optimum contact on release.

In a further aspect of the invention there is provided novel products comprising packaging as hereinbefore defined. Suitably novel products include products 15 adapted for the specific methods as hereinbefore defined with the associated advantages. The products may be provided for filling with substance(s) for release or may be provided containing the substance(s). The products may comprise packaging having features of conformation, configuration and formulation as hereinbefore defined.

20 The invention is now illustrated in non limiting manner with reference to the following figures wherein

- Figures 1a – 1i are sectional and view diagrams of packaging according to the invention comprising primary packaging material having secondary points of weakness;
- 25 Figures 2a and 2b are sectional and view diagrams of packaging according to the invention comprising primary and secondary structures, and conformation options thereof;

Figures 3a and 3b with enlarged views are sectional and view diagrams of packaging according to the invention including locating means;

Figures 4a – 4c are views of configurations of packaging according to the invention with manufacturing method;

- 5 Figures 5a and 5b are views of clustering elements and clustered packaging according to the invention.

In Figure 1 is shown in each case packaging in the form of conformations and configurations typically obtained by dipping from molten or solutions of packaging materials. In Figures 1a to 1g are shown capsules comprising water-dispersible or 10 soluble multiple layers and/or multiple sections of material in the form of peripheral shells (11) and linking portions (12, 13).

Figure 1a shows a capsule having central monolayer of rapid dissolve packaging material and peripheral bilayers of rapid-slow and slow-rapid dissolve packaging material respectively, adapted to provide a weak link or point of weakness as 15 hereinbefore defined. In Figure 1b is shown a capsule having central and peripheral monolayers of rapid dissolve and slow dissolve packaging materials respectively and peripheral bilayer of rapid-slow dissolve packaging material, as an alternative to the configuration of Figure 1a. Variations of these configurations are envisaged and may be determined according to the desired ease of manufacture and desired 20 release characteristics.

The capsule of Figure 1a may be manufactured for example by forming peripheral shells (11a inner, 11d outer) by dipping a former to a first depth into respective solutions of or molten slow and rapid dissolve packaging material respectively, then forming shell (11a outer) by dipping to a greater depth into a solution of or 25 molten rapid dissolve packaging material, simultaneously creating portion (11b) and finally filling and overlap capping the portion (11b) with shell (11d outer), simultaneously creating seal (11c).

The capsule of Figure 1b may be manufactured for example by forming shells (11e inner, 11d) as for 11a inner and 11d outer above, then forming shell (11e outer) by dipping the inner to a lesser depth in slow dissolve packaging material, and filling and overlap capping shell (11d) simultaneously forming seal (11c).

- 5 Figures 1c and 1d show capsules peripheral shells which are shrunk fit about (shaped or moulded) substance and have therebetween secondary points of weakness in the form of an easy dissolving region (12) having an area adapted to peel back, for example on swelling in the form of an unsealed abutment of the two peripheral shells (11d).
- 10 Figures 1e and 1f show capsules comprising an easy dissolving packaging material band (13) bridging a gap between shells (11d). Solid or liquid ingredients are enclosed within the capsule (11d, 11d) and released via the easy dissolving region (13) on rapid dissolution in water.
- 15 Figures 1g shows a capsule comprising a rapid dissolve monolayer peripheral shell (11f) enclosing substance and inner secondary peripheral shell (11d), abutting or overlap sealed to the capsules remote peripheral shell (11d). The capsule may be suited to enclose two same or different substances with staged release, with rapid release of one substance via the rapid dissolve shell (11f) and subsequent release of the second substance by slow dissolve of capsule (11d, 11d).
- 20 In Figures 1h and 1i are shown packaging in the form of a primary dipped bag or wallet (14) which is filled and sealed, with a separate cap portion (15) or by self-sealing by crimping (16) as illustrated. Crimping may optionally provide a release feature in the form of a primary structure as a point of strength portion to prevent premature release or as a secondary point of weakness portion which is for example adapted for rapid dissolving in water to release contents of the bag with subsequent dissolution of the bag or wallet.
- 25

In Figures 2a and 2b are shown a sachet in the form of secondary structure packaging material (21) located around a primary structure mesh bag of slow

dissolving reinforcing packaging material (22) which may be fused or otherwise with the packaging material (21). Packaging material (21) is sealed at the edges.

This packaging is suited for delivery of graded substances whereby rapid dissolving of packaging material (21) releases fine particles from within the  
5 primary structure mesh bag (22), large particles being released later on slow dissolving of mesh bag (22). The sachet may comprise packaging material (21) as flexible or rigid packaging material or a combination thereof which may be flat or formed, for example by vacuum. This configuration may also be employed in other embodiments according to the invention as hereinbefore defined using any  
10 packaging material as desired.

In Figure 3a is shown water-soluble capsule (31) in the form of a first capsule portion, retained by means of a resiliently deformable capsule shell (32) on a support means (33) in locus (34). By locating the water soluble capsule (31) on support means (33) external influences of locus (34) leading to premature release  
15 are minimised. On contact with water the shell (31) dissolves releasing contents, with subsequent dissolution of the locating shell (32).

In Figure 3b is shown a capsule which may be made of water soluble packaging material adapted to be located by means of resiliently deformable wings, thereby locating a capsule in position and potentially damaging external influences within  
20 the locus.

In Figures 4a – 4c are shown configurations of packaging constructed of packaging material (41) with soluble seal or crimp (42). Packaging may be constructed by means including flow wrapping or extruding to form a seamed or seamless tube with seamed sectioning along the length, as shown in Figures 4b(i) and 4b(ii). In  
25 Figures 5a and 5b are shown clustering elements comprising water soluble packaging material (52) according to the invention and clustered water-soluble packaging in the form of capsules (51). On contact with water the clustered capsules dissolve rapidly to release their contents with subsequent dissolution of

the clustering element which serves to aid withstanding external influences leading to premature release prior to contact with water.

CLAIMS

1. Controlled release packaging comprising packaging material which is at least partially or substantially completely dispersible or dissolvable in an effective amount of a water-containing substance and which is adapted to comprise, contain or enclose one or more substances wherein the packaging is adapted for release of comprised, contained or enclosed substances in response to a predetermined stimulus in predetermined manner to a desired locus with substantially simultaneous or subsequent partial or complete dispersal or dissolving thereof.  
5
2. Packaging according to Claim 1 wherein the substance to be released is in the form of solid or liquid and is preferably selected from powders, granules, crystals, microcapsules, monoliths, suspensions, dispersions, concentrates, gels, thixotropes, non-aqueous solutions and the like and mixtures thereof, in a desired grade or range of grades.  
10
3. Packaging according to Claim 1 or 2 characterised by features or combinations of features of packaging conformation and/or configuration and/or packaging material formulation, in manner to provide selection of properties or combinations of properties, wherein features and properties derive from the water-soluble or dispersible packaging material and/or from additional materials or substances formulated, conformed or configured with the water-dispersible or soluble packaging material, or from the conformation or configuration of the packaging and are selected according to the intended use.  
15
4. Packaging according to any of Claims 1 to 3 which is substantially completely dissolvable.  
20
5. Packaging according to any of Claims 1 to 4 which is dispersible or dissolvable in water-containing substance comprising any solid, semi-solid, liquid or gaseous (vapour) fluid which comprises water in effective dispersing or dissolving amount, which may be chemically or physically releasably bound or may be freely available  
25

and may be gathered or accumulated from the substance or readily and instantly taken up by the packaging material.

6. Packaging according to any of Claims 1 to 5 adapted for release in response to a predetermined stimulus comprising any chemical or physical stimulus for dissolving or dispersing, transforming by precipitation or morphology change, fracturing, rupturing or otherwise rendering permeable the packaging or a part thereof to release contained or enclosed substance.  
5
7. Packaging according to any of Claims 1 to 6 wherein the stimulus is the same as or different to the water-containing substance which serves to disperse or dissolve,  
10 wherein materials are dispersible or soluble in hot or cold water-containing substance and/or may release substance by dissolution or by other physical or chemical means such as exposure to heat, acid or alkali, solvents and solvent mixtures, oxidising conditions, radiant energy including UV, microwave and the like or biological degradants.
- 15 8. Packaging according to any of Claims 1 to 7 for release of substance into a locus comprising any place, area or the like into or at which it is desired to release the substance, which may be the same as or may be different to but connecting with a locus at which the substance is to have a desired effect.
- 20 9. Packaging according to any of Claims 1 to 8 comprising a primary and secondary component in terms of conformation, configuration or formulation adapted to dissolve and release the substance to the desired locus and to control stimulus or external influences to which the release element is subjected in manner to provide release with pre-determined timing and in pre-determined manner.
- 25 10. Packaging according to any of Claims 1 to 9 wherein water-dispersible or soluble packaging material comprises a natural or synthetic polymer or mixtures thereof selected from polyvinyl alcohol (PVA), polyethyleneoxide, chemically modified cellulose or cellulose ethers and other cellulose derivatives, modified starches, polyvinylpyrrolidone, polyacrylamide or gelatine or derivatives thereof.

11. Packaging according to any of Claims 1 to 10 in the form of solid or hollow masses, hollow containers or closures such as capsules or sachets or spherical, pyramidal, elongate, annular or conical bags and the like or closures such as membranes, partitions, caps, lids and the like.
- 5    12. Packaging according to any of Claims 1 to 11 comprising a primary structure or regions of packaging material for strengthening, reinforcing, retaining package integrity during release or other such purpose, such as a skeleton, frame work, fibres, mesh, ribbing, webbing, seal or the like integral with or at least partially (co-)continuous with a secondary structure of substantially continuous packaging material.
- 10    13. Packaging according to any of Claims 1 to 12 comprising a primary containing or enclosing shell or layer in the form of a sheath or tablet containing or enclosing a secondary containing or enclosing layer of packaging material.
14. Packaging according to any of Claims 1 to 13 comprising primary packaging material having secondary points of weakness in the form of packaging material formulated for rapid or slow dissolving or fracture, or of flaws or water entraining features such as moulding or embossing in the form of non-penetrating perforations, tear-off strip lines.
- 15    15. Packaging according to any of Claims 1 to 14 comprising means for locating or positioning within the locus into which a contained substance is to be released in manner to secure it at the optimum position for storing, or for timing or activating the release stimulus for example for the operation of dissolving water in the locus on the release element, or to maintain the packaging in desired position in manner to withstand influences such as impact force during handling and storage.
- 20    16. Packaging according to any of Claims 1 to 15 wherein locating means comprise an elongate substantially resilient or flexible portion adapted to be tied or hooked onto or located around a suitable projection or received within a recess of an effective support in the environment in which the packaging is contained, or

may comprise resiliently deformable projections extending in opposing directions from the packaging material as hereinbefore defined and adapted to be deformed to locate between opposing retaining means, surfaces and the like of an effective support means and be retained by resilience.

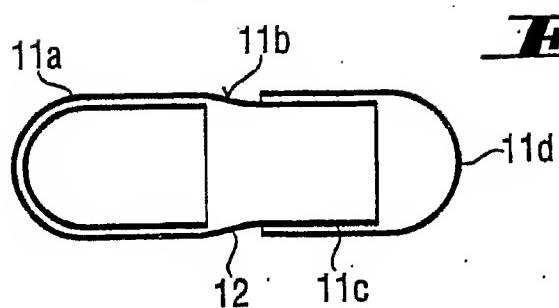
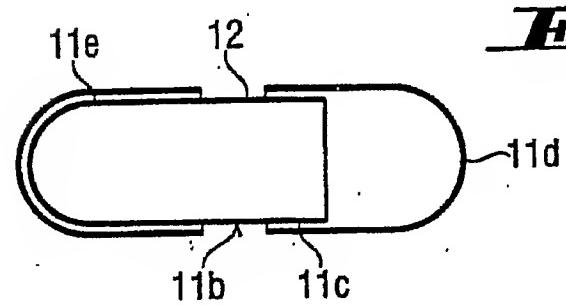
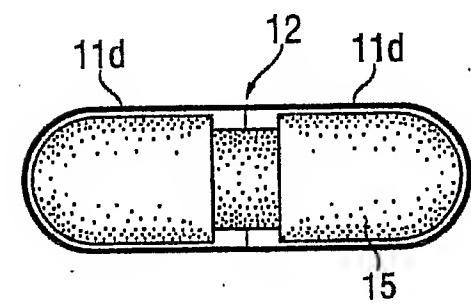
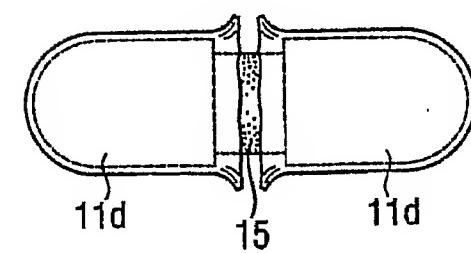
- 5    17. Packaging according to any of Claims 1 to 16 comprising a conformation, configuration or formulation adapted to absorb or dispel external influences to which the packaging may be subjected and which may lead to premature release of contained or enclosed substance.
- 10    18. Packaging according to any of Claims 1 to 17 comprising means to enhance the response thereof to release stimulus, by means of formulation or of additional components incorporated in or contained within the packaging, selected from means adapted to cause release by expanding on contact with water-containing substances, for example comprising swelling or expanding agents, effervescent agents, disintegrants, dispersing agents, or contained gases, such as air at a positive overpressure and the like, stimulus sensitising agents, for example adapted to cause release on change of pH, change in temperature, subjecting to microwave, UV, solvents and solvent mixtures and the like.
- 15    19. Method for the production of packaging as hereinbefore defined in any of Claims 1 to 18 comprising forming packaging material and introducing one or more substances to be released in manner to be comprised, contained or enclosed therein.
- 20    20. Method according to Claim 19 wherein forming packaging materials is by residue free sealing one or more sheets, deforming one or more sheets by action of heat, solvents such as water, vacuum, pressure and the like, extruding, shaping from solution or molten, for example by dipping or spraying onto a former, casting, embossing etc.
- 25    21. Method according to any of Claims 19 and 20 comprising containing or enclosing the substance to be released by sealing by mechanical or chemical means

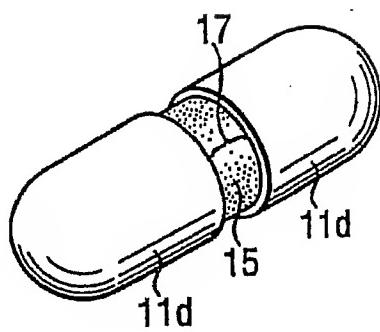
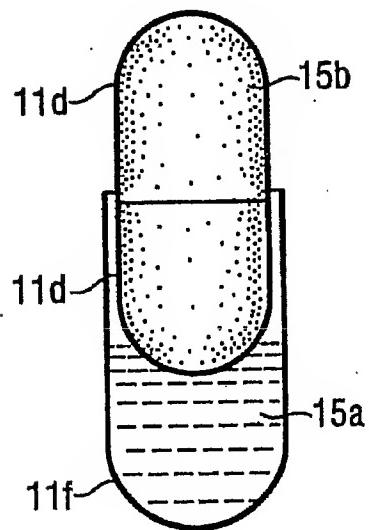
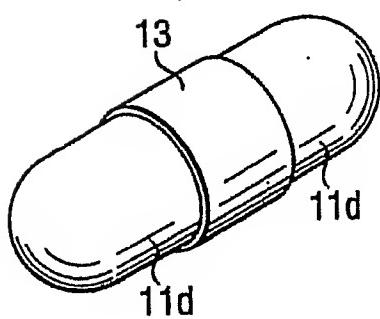
including softening the packaging material with water or a sensitising agent and self bonding to unsoftened or similarly softened packaging material, bonding or welding with solvent, glue, contacting edges of packaging material with a melting point depression sealing fluid such as organic solvent, water, a polymer solution or emulsion, a solution of a proteolytic enzyme producing a protein solution and the like, and applying thermal energy or the like to cause fusion.

- 5 22. Method according to any of Claims 19 to 21 wherein packaging includes an identification element; for example may be printed, moulded, embossed or laser marked to indicate the nature or origin of the contents, the mode of use, or to incorporate features of design.
- 10 23. Method according to any of Claims 19 to 22 wherein packaging or substance to be contained comprises an additional indicating element, for example a component which indicates when dissolution is complete or when the substance has achieved its desired effect.
- 15 24. Method for the controlled release of a substance as hereinbefore defined employing water-dispersable or soluble packaging as hereinbefore defined comprising locating the packaging in a locus for intended release and subjecting to a release stimulus, for example contacting with water- containing substance in effective dispersing or dissolving amount, for an effective period to activate release as hereinbefore defined and release the substance into the locus, wherein the packaging is simultaneously or subsequently substantially completely dissolved in the water containing substance.
- 20 25. Method according to Claim 24 for release of agrochemical substances including pest or plant growth control agents, plant disease control agents, soil improvement agents and the like for farming, greenhouse, horticultural, forestry and like applications on industrial or domestic scale by means of spraying, dusting, drilling and like techniques.

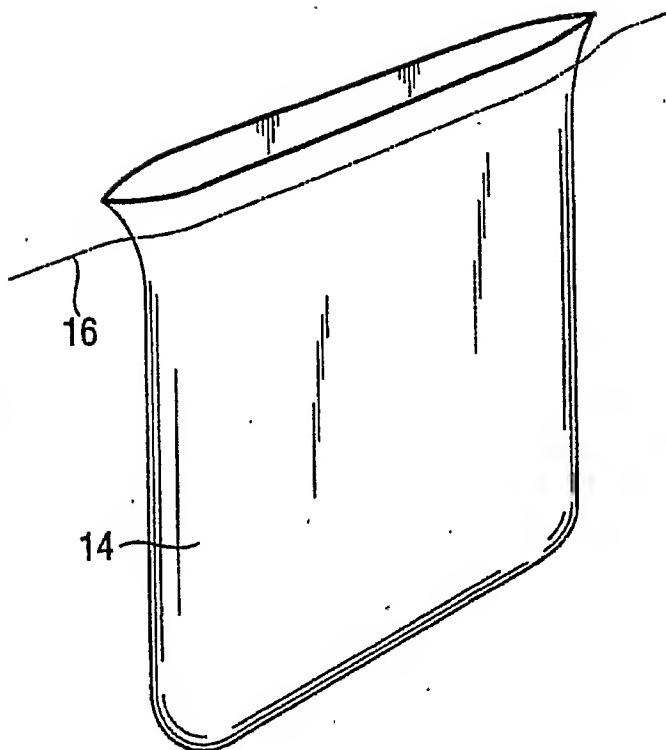
26. Method according to Claim 24 for release of environmental treatment agents such as water purification agents, disinfectants, waste treatment agents and the like, including control agents for water borne viruses, bacterium, organisms and insects which carry disease, natural and industrial contaminants including water borne  
5 plant growth control agents, soil run off dispersant agents, cooling and recycled water neutralising agents and the like.
27. Method according to Claim 24 for handling and release of safe-to-the-point-of-use substances, for example hazardous substances including caustics, chemical reagents, drain clearing substances and the like which may be used in diluted form,  
10 which are relatively safe although unpleasant in powdered, non-aqueous or concentrate form but which become hazardous in solution.
28. Method according to Claim 24 for releasing detergents or other cleaning agents in the form of solids or liquids such as concentrates, including domestic and industrial detergents for cleaning premises, objects and clothing and for personal  
15 hygiene using any known detergents or cleaning agents.
29. Method according to Claim 24 for release of food components including flavours and fragrances in the form of dried or powdered solids, liquids and volatiles, texturising agents, colorants, moisture absorbers such as rice, corn flour, salt and the packaging material itself, oils and fats, dried dairy products and other  
20 food products which deteriorate in the presence of oxygen, seasoning and herbs and the like.

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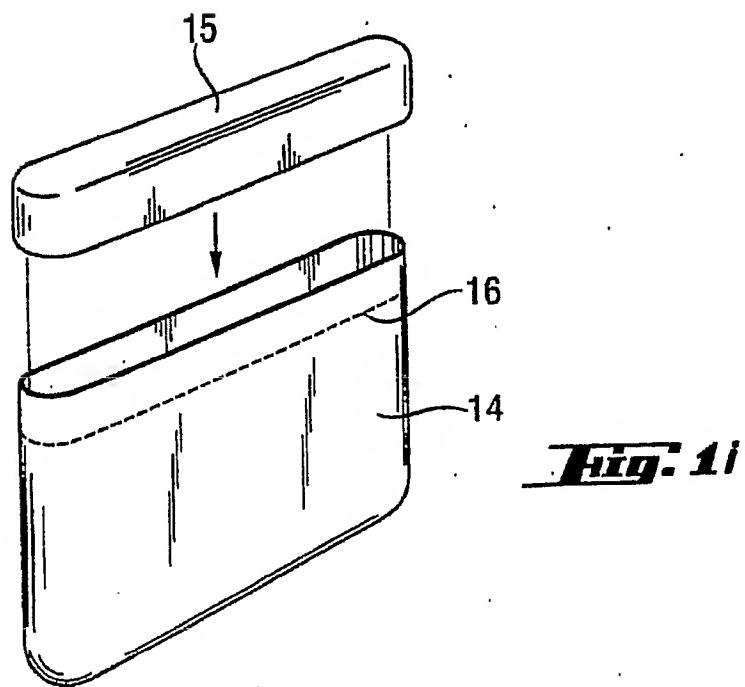
***Fig. 1a******Fig. 1b******Fig. 1c******Fig. 1d***

***Fig. 1e******Fig. 1f******Fig. 1g***

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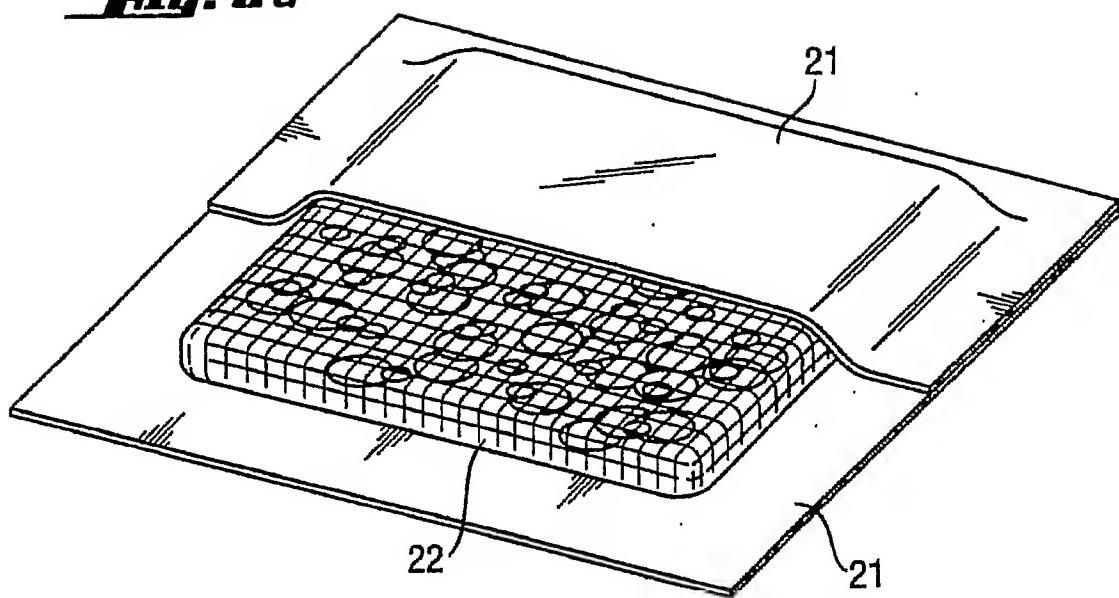
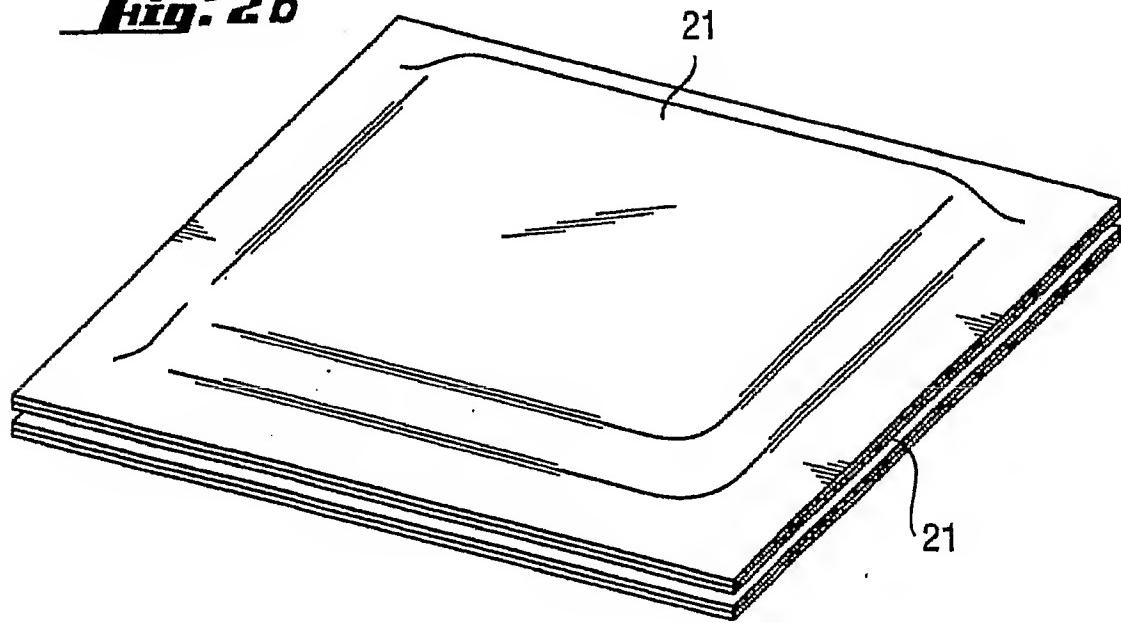


***Fig. 1h***

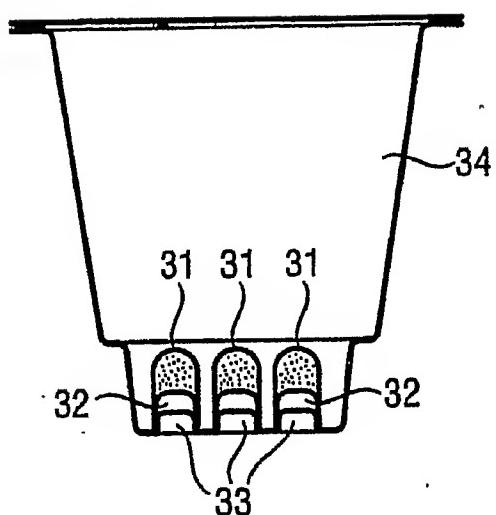
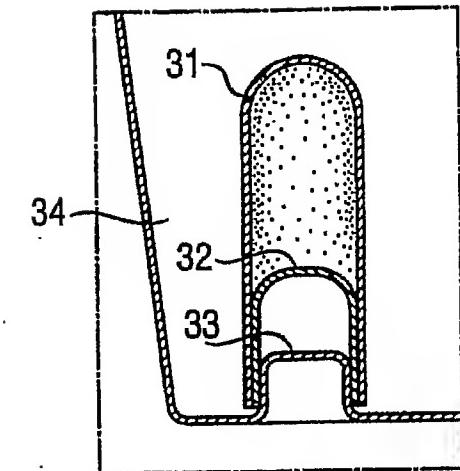
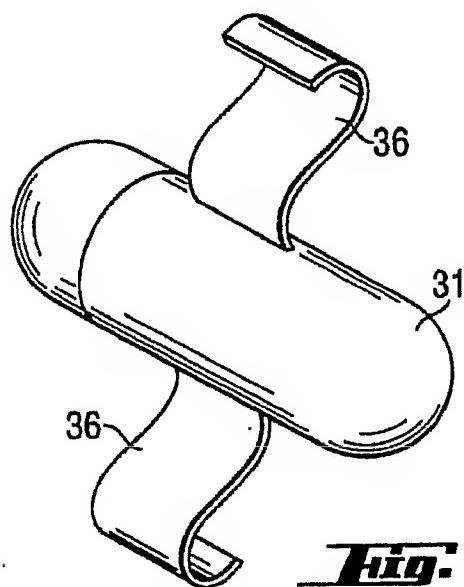
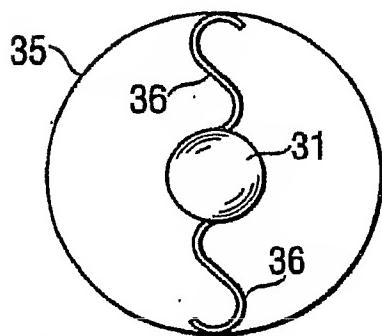


***Fig. 1i***

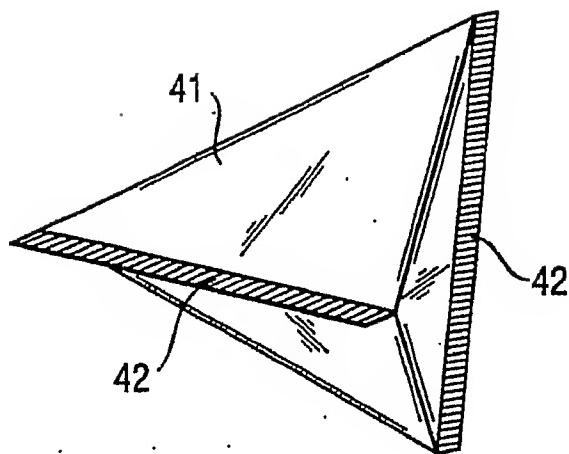
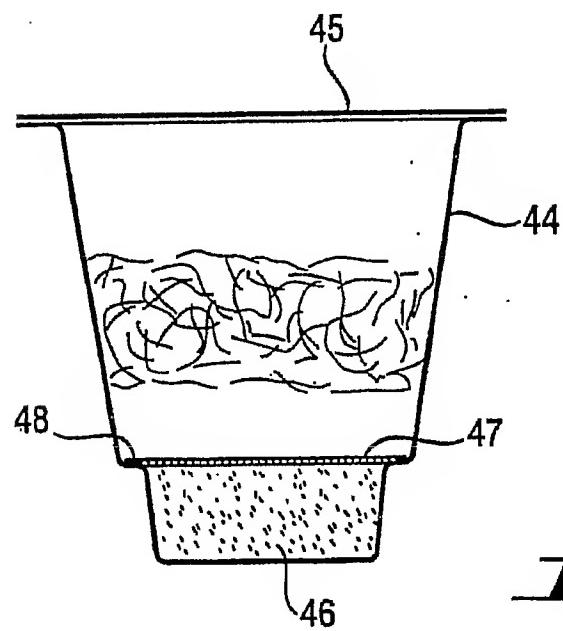
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***Fig. 2a******Fig. 2b***

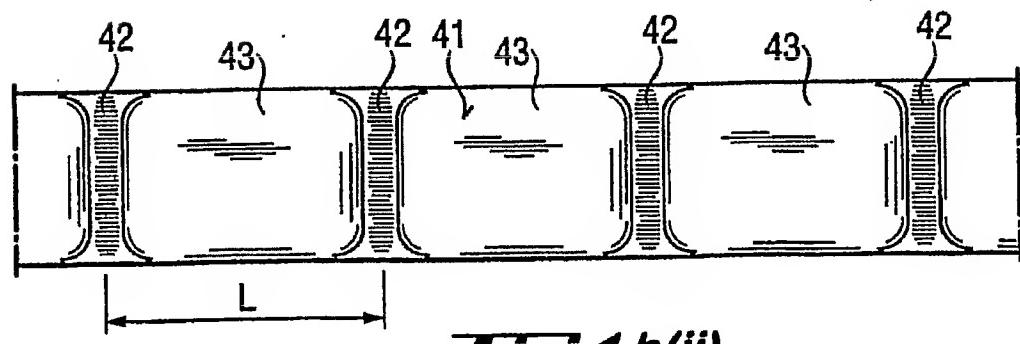
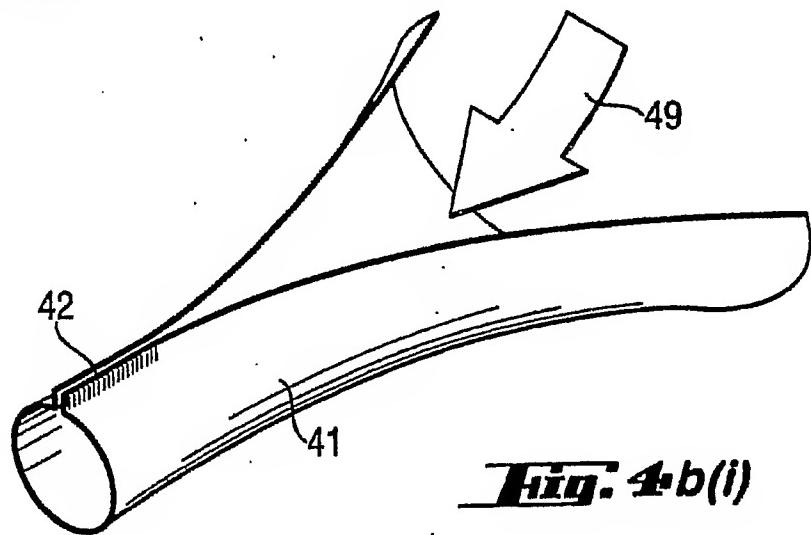
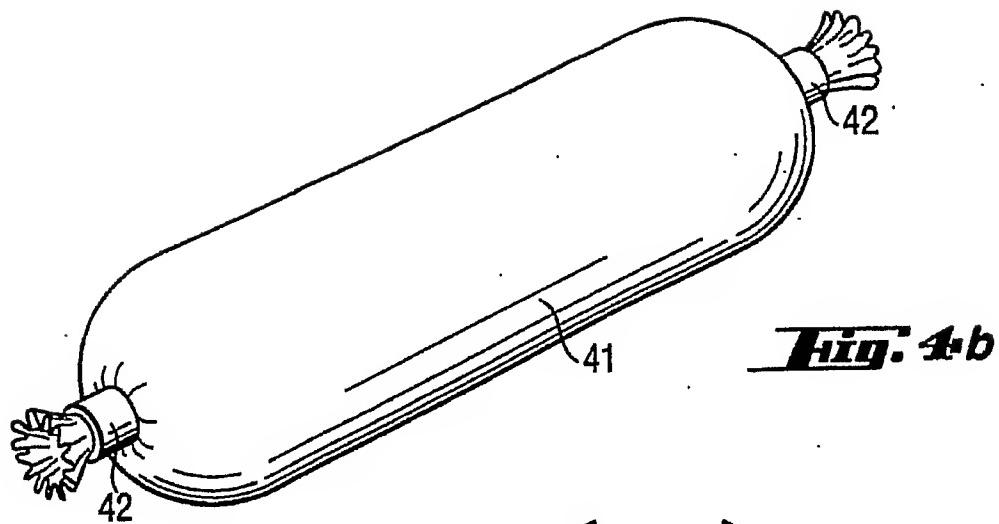
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***Fig. 3******Fig. 3a******Fig. 3b******Fig. 3c***

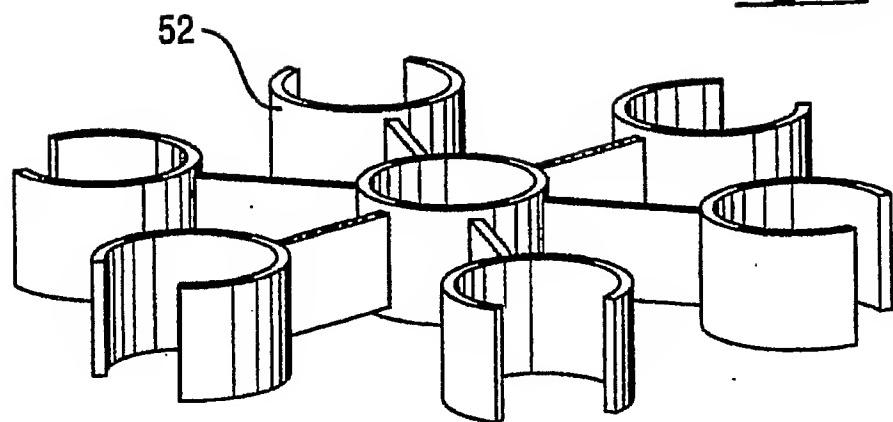
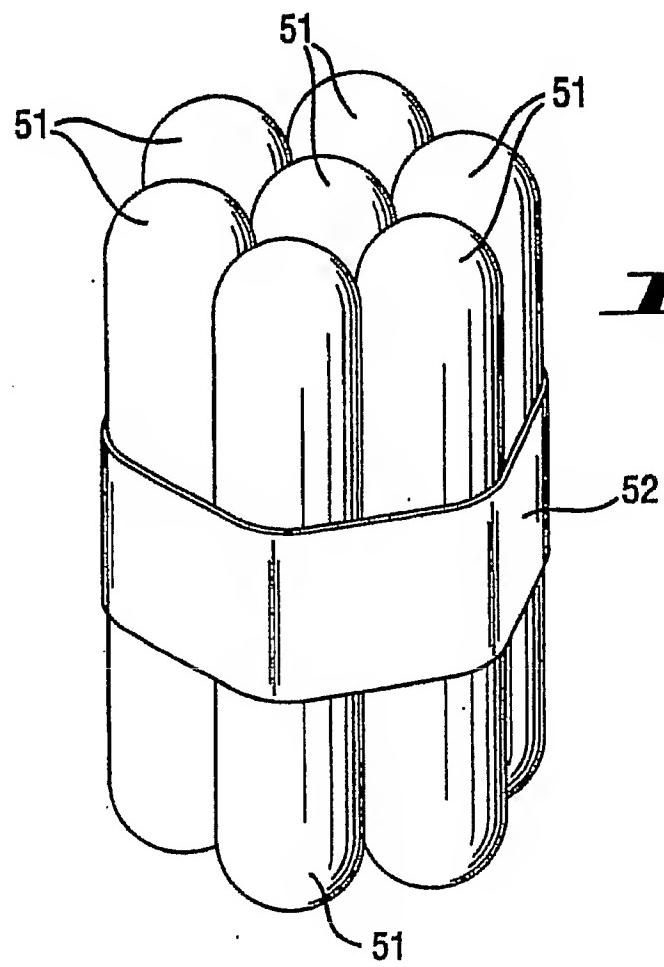
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***Fig. 4-a******Fig. 4-c***

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*Fig. 5a**Fig. 5b*

## INTERNATIONAL SEARCH REPORT

International Application No  
PCT/IB 02/00230A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 B65D65/46 B65D81/32

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

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Y	the whole document ---	12, 14-17, 25-27,29
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X	the whole document ---	1-3
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X	the whole document ---	1-3,18, 24
		-/-

 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

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Date of the actual completion of the international search

Date of mailing of the international search report

18 July 2002

25/07/2002

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PCT

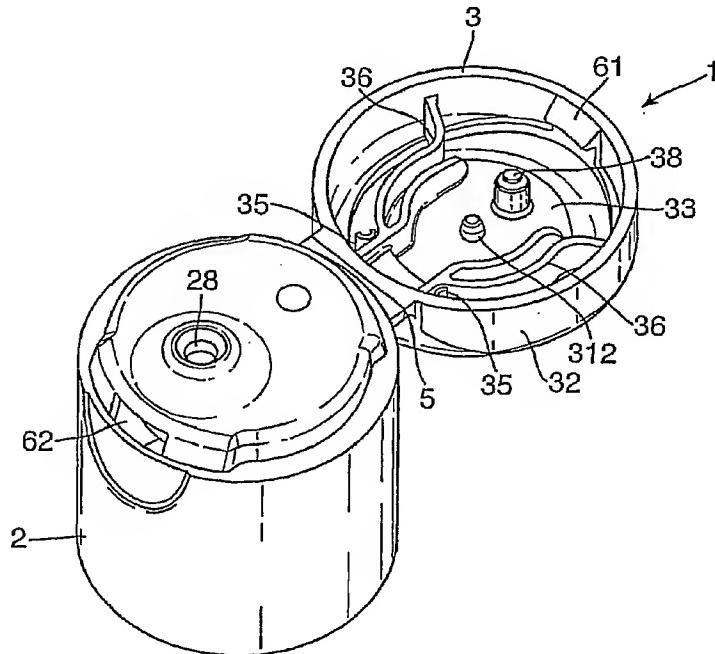
(10) International Publication Number  
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04253917.1 30 June 2004 (30.06.2004) EP  
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(54) Title: DISPENSING CLOSURE

WO 2006/003168 A1



(57) Abstract: A child resistant dispensing closure 1 having a smooth external surface. The closure 1 comprises a body 2 and a lid 3, connected together by a hinge 5. The lid 3 is held closed against the body 2 by a catch 6. The closure 1 has a resilient ring 4, which in its deformed configuration co-operates with the catch 6 to unlock it and provides a lifting region 65, by which a user may lift the lid 3 of the closure 1.



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## Description

### DISPENSING CLOSURE

- [001] The present invention concerns a dispensing closure, having a body and a lid. The body defines a dispensing orifice through which the contents of a container, to which the closure is attached, may be dispensed. The lid is attached to the body by a hinge, which allows the lid to swing between a closed position, in which the lid occludes the dispensing orifice, to an open position, in which the dispensing orifice is exposed and the contents of the container may be dispensed. In particular, the dispensing closure according to the present invention is a child resistant dispensing closure and includes a catch to lock the lid in its closed position. The lid can only be opened, upon application of two discrete, dissimilar movements, simultaneously by a user. This is generally considered difficult for a child to achieve and is unlikely to result in the closure being opened accidentally.
- [002] A child resistant closure of this general type is disclosed in US 4790442 --. This patent describes the need for two different and dissimilar movements to prevent the lid from being opened by a child. This patent also discusses the desirability of providing alignment between the adjacent surfaces of the body and the lid, to prevent the lid from being easily grasped to exert an opening force on the lid. In the closure described in this patent, a user must first squeeze radially inwardly, on the two opposing sides of the lid on either side of the hinge, to expose an edge opposite the hinge, by which the lid may then be lifted. This squeezing movement also temporarily releases a catch.
- [003] The lid of the closure described in US 4790442 --, has a generally planar top plate with a downwardly depending sidewall. An arcuate slot extends through the top plate opposite the hinge and adjacent to the sidewall. The slot allows the sidewall of the lid to be squeezed at two diametrically opposed points, thereby displacing a portion of the sidewall opposite the hinge. This displacement releases a catch and also provides an overhang on the lid relative to the body, by which the lid may be lifted.
- [004] A disadvantage of this arrangement is that the top plate of the closure does not support the distorted portion of the sidewall. The arcuate slot subtends an angle of at least 180°, to allow the necessary deformation of the sidewall. However, during the second stage of the opening movement, a user must lift the lid by this unsupported section of sidewall, which will be difficult and will result in axial movement of the sidewall relative to the planar top plate. Repeated movement will lead to damage of the

unsupported sidewall and may render the catch (which is carried by this portion of the lid) ineffective.

[005] A further disadvantage of this arrangement is that, unlike the sidewalls of the lid and the body, which join to form a continuous surface, the top plate of the sidewall is disjointed by the arcuate slot. This slot may collect dirt or may be used to prise open the closure using the teeth for example, which will further reduce the effectiveness of the closure.

[006] The closure according to the present invention, overcomes these disadvantages by providing a dispensing closure having a lid that includes a top plate, which covers the ring in both its normal and deformed states and in its deformed state. The ring unlocks the catch temporarily, whilst defining a lifting tab to allow the lid to be moved to its open position.

[007] In the closure according to the invention, the top plate of the closure has a smooth surface with no cavities therein to trap dirt or other foreign objects and cannot be easily manipulated to overcome the catch arrangement. Furthermore, the lifting region of the ring is supported by the top plate and when a user applies axial force to the lifting region to lift the lid, the ring is braced by the top plate, making the lid easier to open.

[008] In use, a user squeezes the ring on either side of the hinge, ovalising the ring, which causes the catch to be released and also provides an overhang portion relative to the body, opposite the hinge. In order to open the closure, a lifting force must be applied simultaneously with the squeezing force required to release the catch and provide the overhang portion. If the squeezing force is released before the lifting force is applied, the catch will re-engage and the resilient ring will relax obliterating or at least minimising the overhang portion. This will make it difficult to open the lid. The two discrete, dissimilar movements, simultaneously applied, prevent the closure from being opened easily by a child.

[009] The lid may be formed in two parts: A resilient ring, forming the sidewall of the lid and a separate top plate. An advantage of this arrangement is that the radial deformation of the ring is unrestricted. The top plate is specifically designed to cover the ring in both its relaxed and deformed states, whilst providing a smooth surface to the top of the closure. Also, the externally facing surface of the top plate may be adapted to provide different colours, surface finish or promotional opportunities. A disadvantage of this arrangement is that it requires assembly of the two portions of the lid and this may be undesirable in high volume production process.

[010] Accordingly, in an alternative embodiment of the closure, the lid is produced in one-piece, with a top plate and a sidewall depending downwardly therefrom. Again, the resilient ring is provided by the sidewall, but in this embodiment, the end of the sidewall adjacent to the top plate is constrained by the top plate, with which it is

integrally moulded.

[011] The radial deformation of the sidewall / ring is thereby reduced and the lateral squeezing force applied to the sidewall / ring will result in both radial deformation and axial deformation of the ring and the associated areas of the top plate.

[012] In this embodiment, if the free edge of the sidewall of the lid is contiguous with the adjacent surface of the body, the squeezing of the sidewall may both release the catch, due to the radial component of deformation, and lift the lid, due to the axial component of deformation. This is clearly a disadvantage from a child resistance viewpoint, because the lid of the closure may be opened by a single squeezing movement. A closure having this disadvantage is disclosed in

US 5683016 --.

(equivalent to

US 5683016 --.

).

[013] In the closure according to the invention, the free edge of the side wall of the lid is spaced from the adjacent surface of the body, to allow the portion of the side wall which is squeezed to deform axially as well as radially, without the side wall pressing against the base and thereby lifting the lid as the catch is released. A disadvantage of this arrangement is that the gap between the free edge of the side wall of the lid and the adjacent surface of the body may allow a child to manipulate the lid, by biting for example. In order to overcome this disadvantage, the upper surface of the body or the free edge of the lid sidewall may be extended, to cover the gap between the base and the lid and prevent easy access thereto. The portion of the sidewall opposite the hinge is left unprotected, to allow uninhibited deformation of the ring / sidewall to produce a lifting region.

[014] Another embodiment of the invention proposes, a closure, comprising a body and a lid connected together by a hinge, with windows provided in the sidewall and / or the adjacent top plate of the lid. A separate, resilient ring is fixed inside the lid and portions of this ring protrude through the windows to allow the ring to be squeezed laterally on either side of the hinge. On squeezing, the portion of the resilient ring opposite the hinge protrudes radially outwardly, through another window in the sidewall, and thereby releases the catch and provides a lifting region, by which the lid may be lifted and opened.

[015] This design may be enhanced by providing tabs attached to the resilient ring, arranged to protrude through the windows. The tabs may be further enhanced by including finger recesses, to improve the ease with which the ring may be laterally squeezed by a user. Furthermore, the lifting region may be provided by a further tab, which projects from the lid as the ring is deformed, to improve the ease of lifting and

opening the lid, after the ring is deformed by squeezing.

[016] This embodiment combines the advantage of a freely deformable resilient ring, which is unconstrained by the lid or the sidewall, whilst ensuring that the ring is completely surrounded by a top plate and sidewall of the lid to achieve a substantially smooth surface. It will be understood that the ring and windows may be designed to enhance the smooth, contiguous flow of the surface of the closure.

[017] The present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

[018] FIGURE 1 shows an isometric view (looking from the top) according to a first embodiment of the invention, with the lid in its open position.

[019] FIGURE 2 shows an exploded, isometric view (looking from the top) of the same closure as that shown in FIGURES 1, with the lid open and separate top plate (not yet assembled).

[020] FIGURE 3 shows a plan view of the closure shown in FIGURES 1 and 2, with the lid in its closed, normal position.

[021] FIGURE 4A shows a plan view of the closure shown in FIGURE 2, with the lid in its deformed position.

[022] FIGURE 4B shows the same plan view as FIGURE 4A, with the separate top plate removed.

[023] FIGURE 5 shows side view of a one-piece closure according to a second embodiment of the invention having a lid comprising a top plate with an integral sidewall depending from the periphery thereof.

[024] FIGURE 6 shows an isometric view (looking from the top) of the same closure shown in FIGURE 5, with the lid in its open position.

[025] FIGURE 7 shows an isometric view of the closure shown in FIGURES 5 and 6 with the lid in its closed, normal position.

[026] FIGURE 8 shows the same closure as shown in FIGURE 7 in its closed, deformed position.

[027] FIGURE 9 shows an isometric view of another embodiment of the invention (similar to the closure shown in FIGURES 5 to 8), with its lid in a closed, normal position and having shield elements.

[028] FIGURE 10 shows an isometric view the same closure shown in Figure 9 in its open position.

[029] FIGURE 11 shows an isometric view of another embodiment of the invention, with its lid in a closed, normal position and having an alternative design of shield elements

[030] FIGURE 12 shows an isometric view of the closure shown in FIGURE 11, with the lid in its open position.

[031] FIGURE 13 shows a side view of a closure according to yet another embodiment of

the invention, having tabs, which protrude through windows in the sidewall / lid of the closure.

[032] FIGURE 14 shows an isometric view (looking from the top) of the closure shown in FIGURES 13, with the lid in its open position.

[033] FIGURE 15 shows an exploded view of the closure shown in FIGURES 13 and 14).

[034] FIGURE 16 shows a plan view of the closure shown in FIGURES 13 to 15, with the lid in its closed, normal position.

[035] FIGURE 17 shows a plan view of the closure shown in FIGURES 13 to 16, with the lid in its deformed position.

[036] In the attached description, the closure is described in relation to an "upright" orientation, where the main axis of the closure is aligned to the vertical and the body of the closure lies vertically below the lid. Wherever possible like parts have been designated using the same reference numerals.

[037] Referring to the attached Figures, a dispensing closure 1 according to the invention generally comprises a body 2 and a lid 3. The body 2 is adapted to be connected to a container (not shown) by means of mutually co-operating screw threads or snap beads, for example. Preferably, the connection between the body 2 and the container is a permanent connection, which prevents easy removal of the closure 2 from the container. Instead, the body 2 has a dispensing orifice 28, through which the contents of the container may be dispensed. The lid 3 has a top plate 31, from which a sidewall 32 depends downwardly and a plug 38, designed to co-operate with the dispensing orifice 28. A hinge 5 connects the lid 3 to the body 2, and allows the lid 3 to be moved swingingly between a closed position, in which the plug 38 occludes the dispensing orifice 38 and an open position, in which the dispensing orifice 28 is unobstructed and the contents of the container may be dispensed..

[038] In a first embodiment of the invention (see Figures 1 and 2), the top plate 31 is formed as a separate component to the remainder of the lid 3, which comprises an inner central panel 33 and a sidewall 32. The plug 38 is carried on the inner central panel 33.

[039] The sidewall 32 of the lid 3 is connected to the inner central panel 33 by rigid arms 35 adjacent to the hinge 5 and resilient curved arms 36 distant from the hinge 5 (see Figures 2 and 3). The number and position of the curved arms 36 are chosen to hold the sidewall 32 firmly to the inner central panel 33, and act to limit undesirable axial movement as the lid is opened and closed. The resilient curved arms provide a degree of resistance to the squeezing movement of the user required to deform the sidewall 33, without preventing the deformation thereof altogether. This limited resistance is expected by a user, to provide feedback about the degree of squeezing force applied.

[040] A separate top plate 31 is fixed to the upper surface of the lid 3, by means of a hole

332 and spigot 312 joint (as shown in Figure 2). The hole 332 and spigot 312 joint is designed to be permanent, once assembled and the separate top plate 31 is difficult to remove from the inner central plate 33 of the lid 3.

[041] In this embodiment, the sidewall 32 provides the resilient ring 4 and carries one part of the catch 6. The other part of the catch 6 is carried on the body 2. As shown in Figure 1, the catch 6 comprises a tab 61, which engages in a slot 62. In Figure 1, the tab is shown carried on the resilient ring 4 and the slot is defined in the body 2, but these two parts of the catch 6 may be reversed. Alternatively, the catch 6 may comprise two inter-engaging tabs rather than a tab and a slot.

[042] Figure 3 shows a plan view of the closure 1, in its closed, normal position. As shown, in this position the separate top plate 31 covers the whole of the upper surface of the resilient ring 4. Referring to Figures 4A and 4B, to open the closure, a user squeezes the resilient ring on either side of the hinge 5. On squeezing, the ring 4 deforms (ovalises) and thereby releases the tab part of the catch 61 from the slot 62. Also, the deformed ring 4 creates an overhang 65 on the lid 3 with respect to the body 2. This overhang 65 is used to lift the lid 3, disengaging the plug 38 from the dispensing orifice 28. It should be noted that on ovalising, the deformed ring 4 unlocks the lid but does not open the lid 3. A second separate and distinct lifting movement must be applied by the user simultaneously with the squeezing movement.

[043] Figures 5 and 6 show a second embodiment of the invention, having the same general structure as that described above. A closure 1 comprises a body 2, for fixing to a container (not shown), and a lid 3 connected together by a hinge 5. Again the lid 3 comprises a top plate 31 with a sidewall 32, depending downwardly from the periphery thereof. The sidewall 32 provides the resilient ring 4 required by the invention, but in this embodiment, the top plate 31 and sidewall 32 are moulded integrally (as a single component). This allows high volume production, but the integral nature of the top plate 31 and the side wall 32 means that the top plate 31 inhibits deformation of the ring 4 / sidewall 32.

[044] In fact, it has been found that when the sides of the ring 4 / sidewall 32 are squeezed by a user, the ring 4 / sidewall 32 has two components of deformation. Radial deformation, which is required to unlock the catch 6 and provide the lifting region 65 required according to the invention, and axial deformation, which is undesirable because the side wall 32 presses against the adjacent surface of the body 2 and tends to lift the lid 2. In this embodiment, this problem is overcome by leaving a gap 7 between the free edge of the side wall 32 and the adjacent surface of the body 2, which is sized such that the axial deformation of the ring 4 / sidewall 32 can be accommodated, without lifting the lid 3.

[045] A plurality of ribs 37 is also provided between the top plate 31 and sidewall 32 to

allow the closure to resist any axial top load. The ribs 37 are sized and positioned to stabilise the lid 2, should it be subjected to a top load, during transport, for example.

[046] Referring to Figures 7 and 8, to open the closure 1, a user again squeezes either side of the lid 2 to deform the resilient ring 4 / side wall 32. In this embodiment, the sidewall 32 is constrained at its top edge by the top plate 31. Thus, the squeezing movement tends to push the sidewall 32 radially inwardly and downwardly (as shown in Figure 8. As described in relation to the previous embodiment the squeezing movement unlocks a catch (not shown in Figures 7 and 8) and also provides a lifting region 65, by which the lid 3 may be lifted.

[047] This embodiment may be further enhanced by providing a shield 71, to cover the gap 7 and provide a smooth surface to the closure 1 (as shown in Figures 9 and 10). The shield 71 is preferably interrupted at the hinge 5 and the opposing portion of the side wall 32 (adjacent to the catch 6), to allow room for outward radial movement of the side wall 32, required to unlock the catch 6 between the body 2 and the lid 3.

[048] In a variation to this embodiment (see Figures 11 and 12), the shield portions 71 may be extended to provide finger pads, which the user may use to indirectly squeeze the sidewall 32 of the lid 3. This arrangement has the advantage that the user is unaware of the radially inward tilting of the free edge of the sidewall 32 (shown in Figure 8), when squeezing pressure is applied to the pads. In this arrangement, the shield portions 71 may be relieved (for example, cut away or flared outwardly) in the vicinity of the hinge 5, to allow unrestricted opening and closing of the lid 3 on the body 2.

[049] Referring to Figures 13 to 15, in a final embodiment of the invention, the lid 3 of the closure 1 is formed in one piece and is again connected to a body 2 via a hinge 5. A plurality of windows 39 is defined in the lid 2 in the sidewall 32 and/or top plate 31. A separate resilient ring is assembled inside the lid 2 by a known permanent joint arrangement (e.g. hole and spigot arrangement as previously described and as shown in figures 14 and 15). The permanent joint between the lid 3 and the resilient ring 4 is designed to allow free deformation of the majority of the ring 4. In other words, the ring 4 is preferably attached to the lid 2 at one point only.

[050] A pair of squeeze tabs 41 may be carried on the ring, such that they protrude through the windows 39. Preferably, the squeeze tabs 41 are shaped to accommodate a user's fingers comfortably. A lifting tab 65 is also carried on the ring 4, opposite the hinge 5 and may protrude through an associated window 39 in the sidewall 32 of the lid 3.

[051] Referring to Figures 16 and 17, a user who wants to gain access to the contents of the container squeezes the squeeze tabs 41, deforming the ring 4 and unlocking the catch 6. As illustrated in Figure 17, the deformation of the ring also causes a lifting

portion 65 to protrude from the lid 2, opposite the hinge, allowing the lid 2 to be lifted and thereby opened.

[052] The examples described above are included as illustrative of the present invention only and other resilient ring designs, falling within the scope of the claims, will be apparent to the man skilled in the art, without departing from the general teaching of the invention.

## Claims

- [001] A dispensing closure comprising  
- a body for connection to a container,  
- a lid, moveable relative to the body between open and closed positions,  
- a catch arranged to lock the body and the lid together, when the lid is in its closed position, and  
- a resilient ring, having a normal and deformed state,  
characterised in that  
the lid includes a top plate, which covers the ring in both its normal and deformed states and in its deformed state, the resilient ring unlocks the catch temporarily whilst defining a lifting tab, to allow the lid to be moved to its open position.
- [002] A child resistant closure according to claim 1, wherein at least part of the catch is carried on the resilient ring.
- [003] A dispensing closure according to claim 1 or claim 2, wherein the lid comprises top plate and integral sidewall depending from the periphery thereof, the resilient ring is carried inside the lid and the lid includes a plurality of windows, through which the resilient ring may be pressed to cause deformation.
- [004] A dispensing closure according to claim 3, wherein the sidewall includes a plurality of windows, finger tabs are carried by the resilient ring and the finger tabs protrude through the windows making it easier for a user to deform the resilient ring.
- [005] A dispensing closure according to claim 4, wherein two substantially diametrically opposed finger tabs are provided to allow a user to squeeze the resilient ring, thereby deforming it to unlock the catch and expose the lifting tab.
- [006] A dispensing closure according to claim 1 or claim 2, wherein the resilient ring is integral with the top plate and depends from the periphery thereof.
- [007] A dispensing closure according to claim 6, wherein a gap is provided between adjacent surfaces of the body and the lid to accommodate axial movement of the resilient ring as it deforms.
- [008] A dispensing closure according to claim 7, further comprising a shield to prevent access to the gap.
- [009] A dispensing closure according to claim 8, wherein the shield is segmented to allow access to the lifting tab.
- [010] A dispensing closure according to any of the preceding claims, wherein the external surface of the closure is adapted to be smooth and continuous.

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Fig.1.

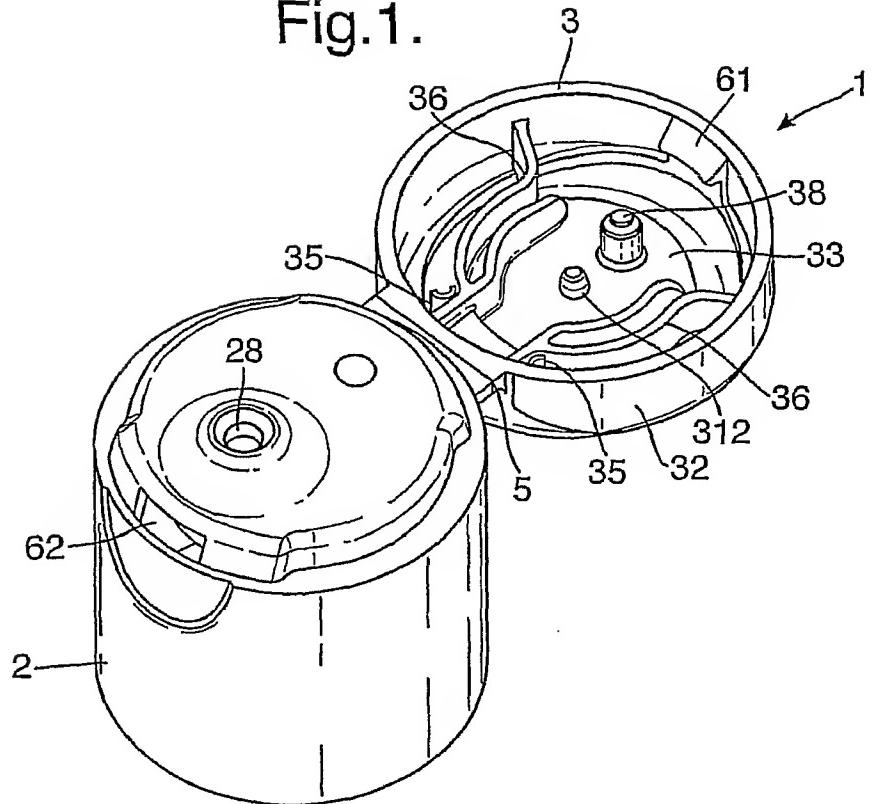
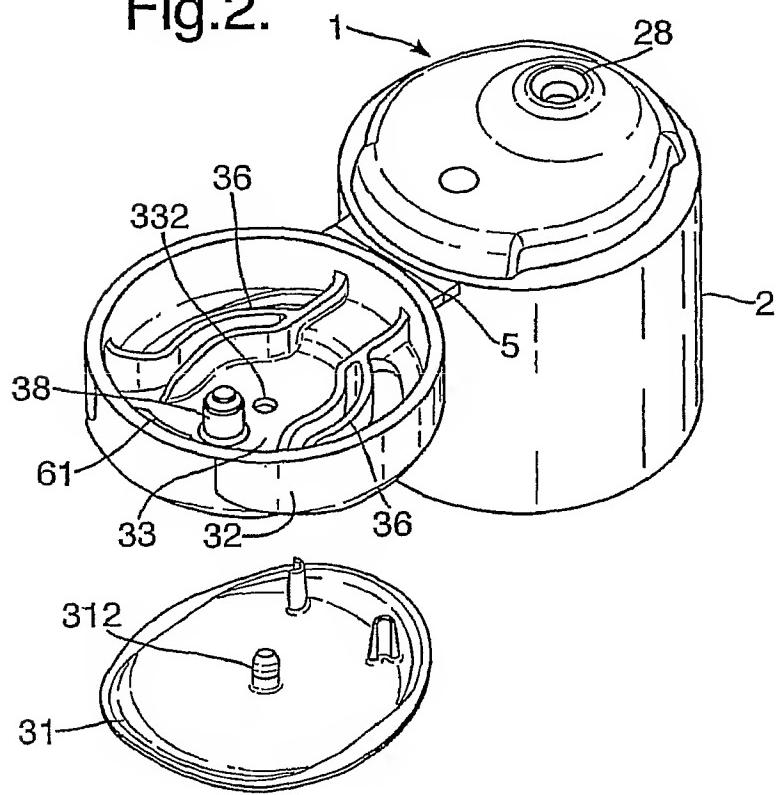


Fig.2.



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Fig.3.

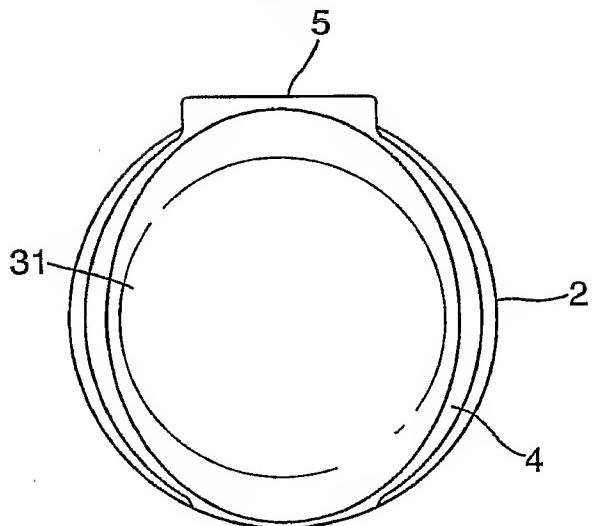


Fig.4A.

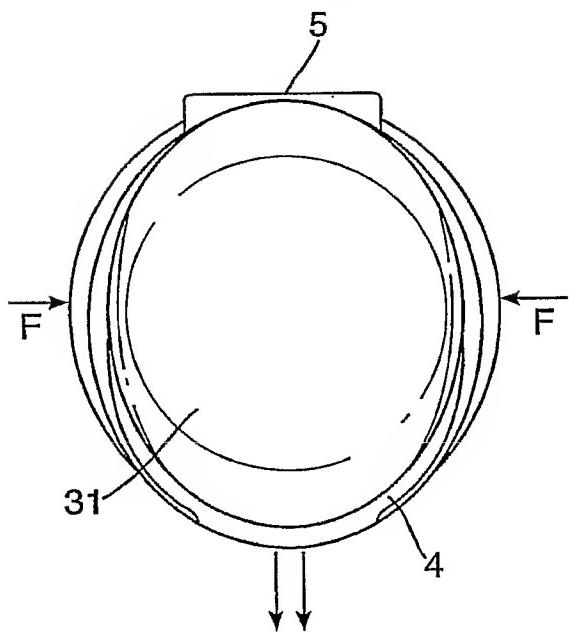
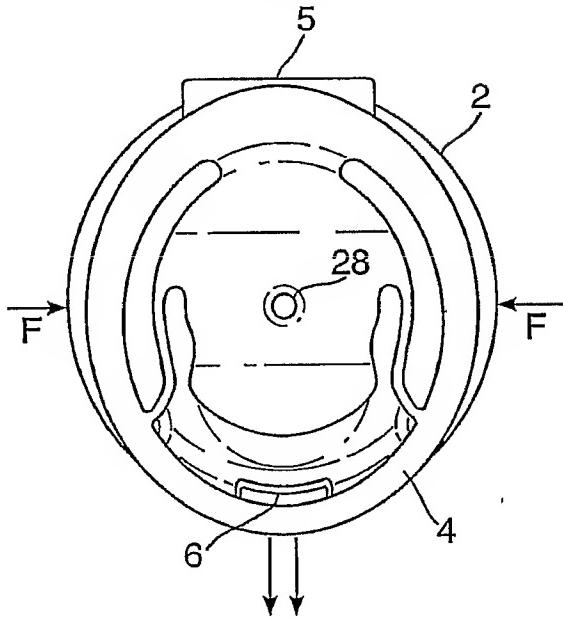
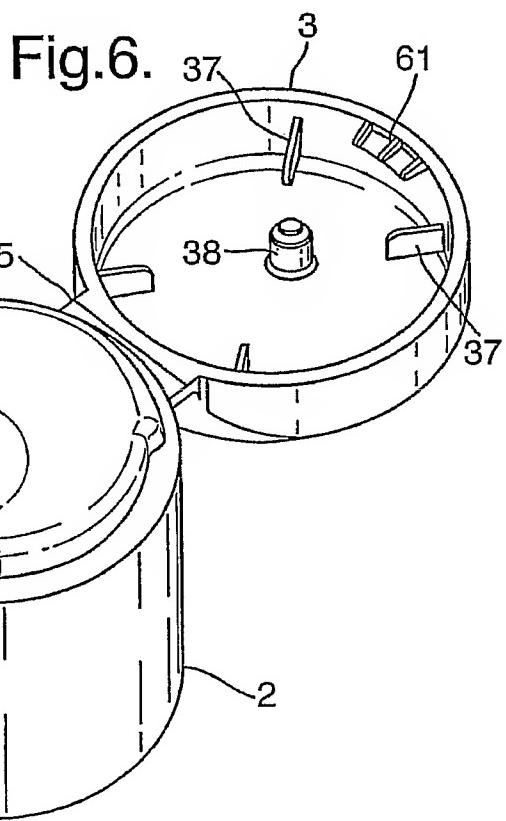
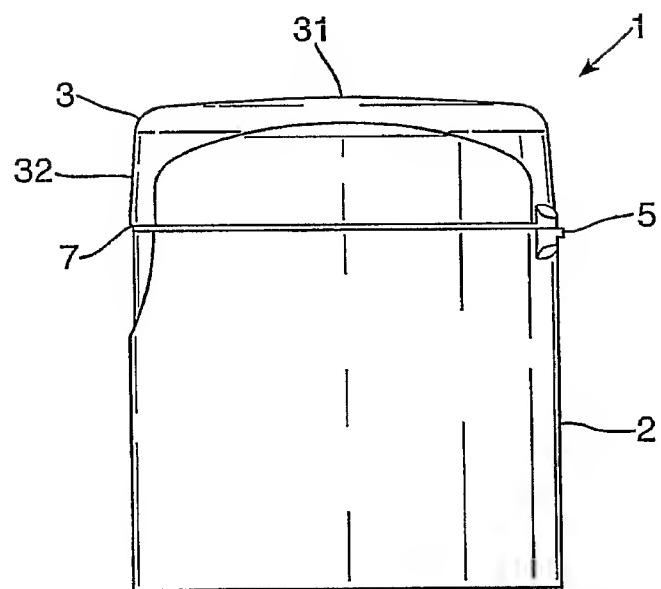


Fig.4B.



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Fig.5.



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Fig.7.

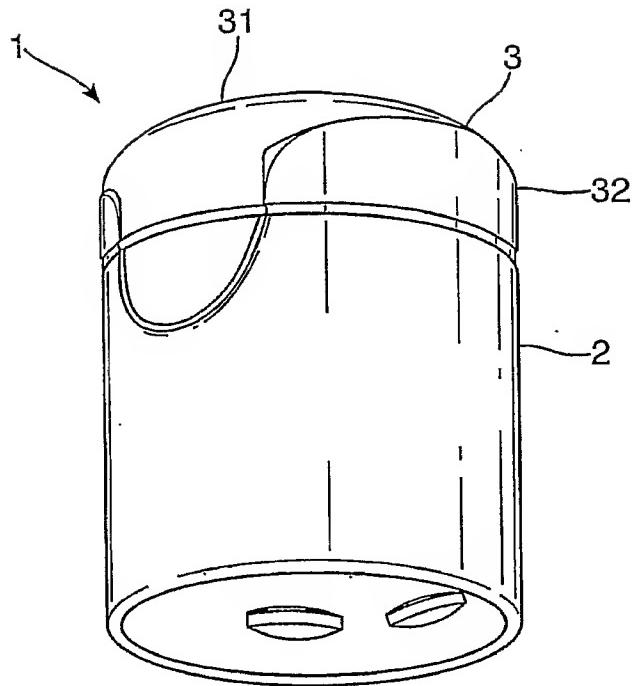
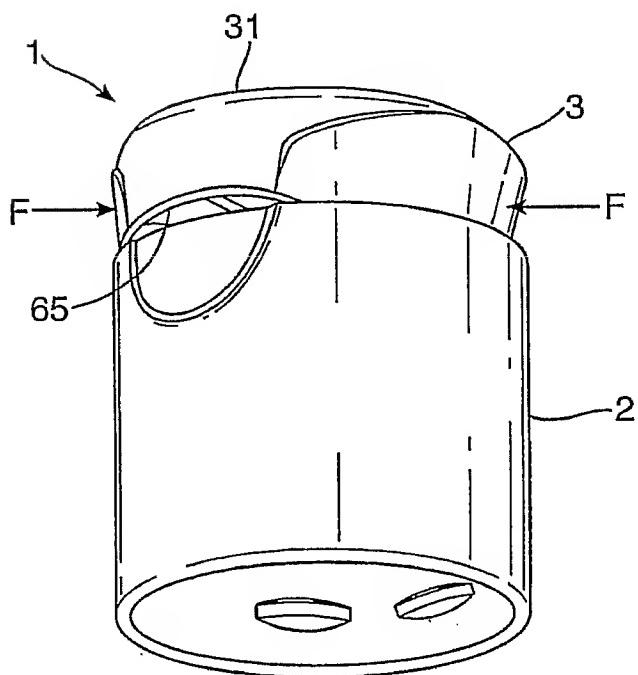


Fig.8.



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Fig.9.

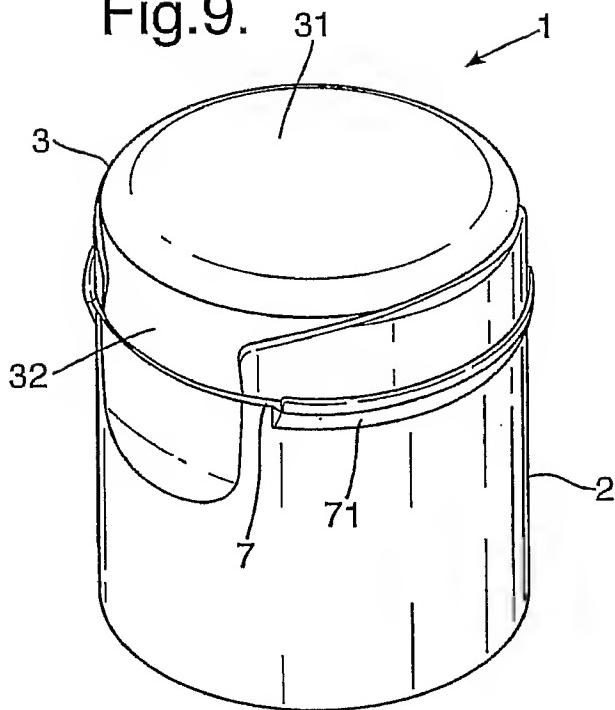
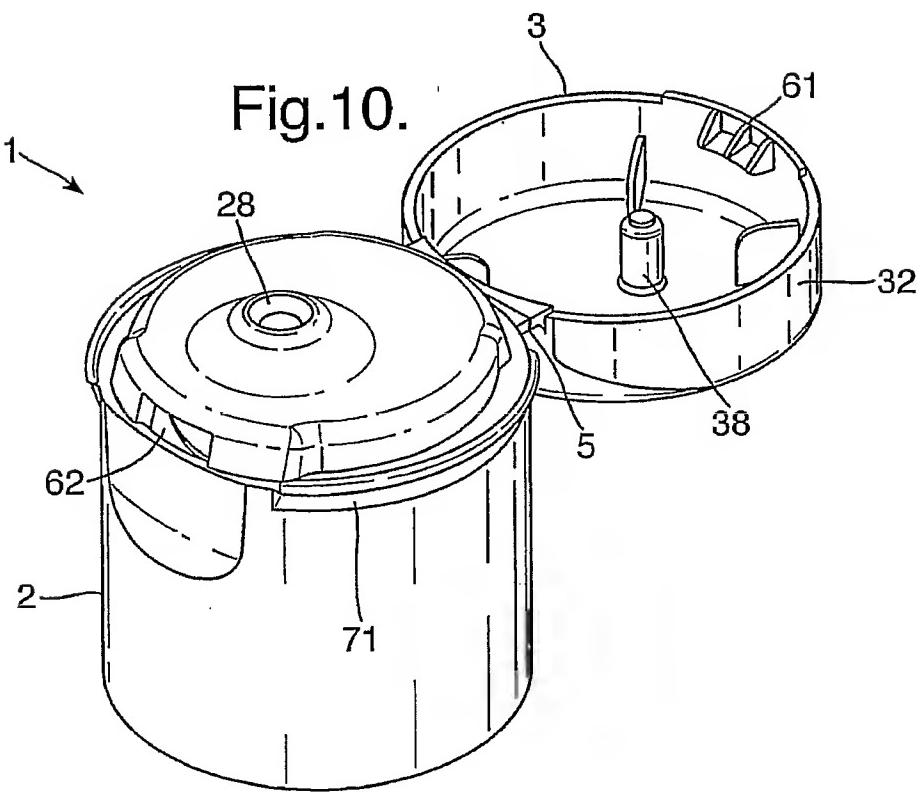


Fig.10.



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Fig.11.

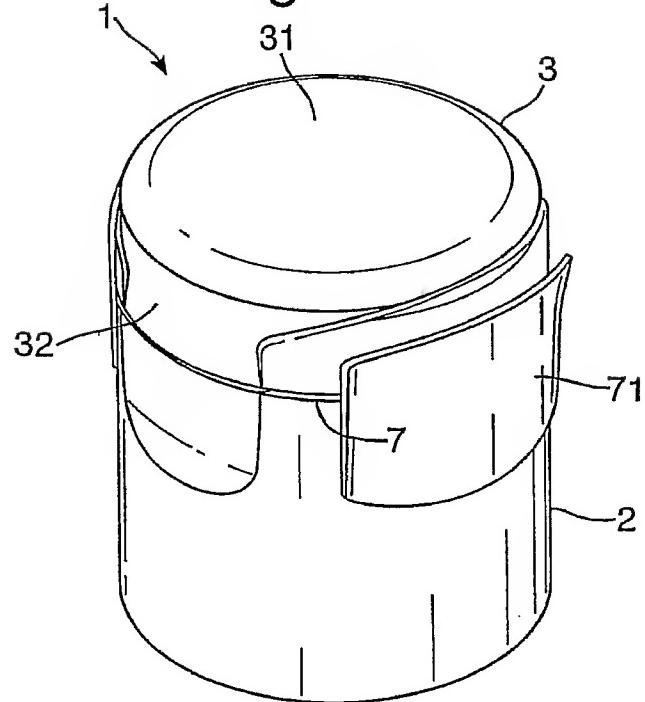
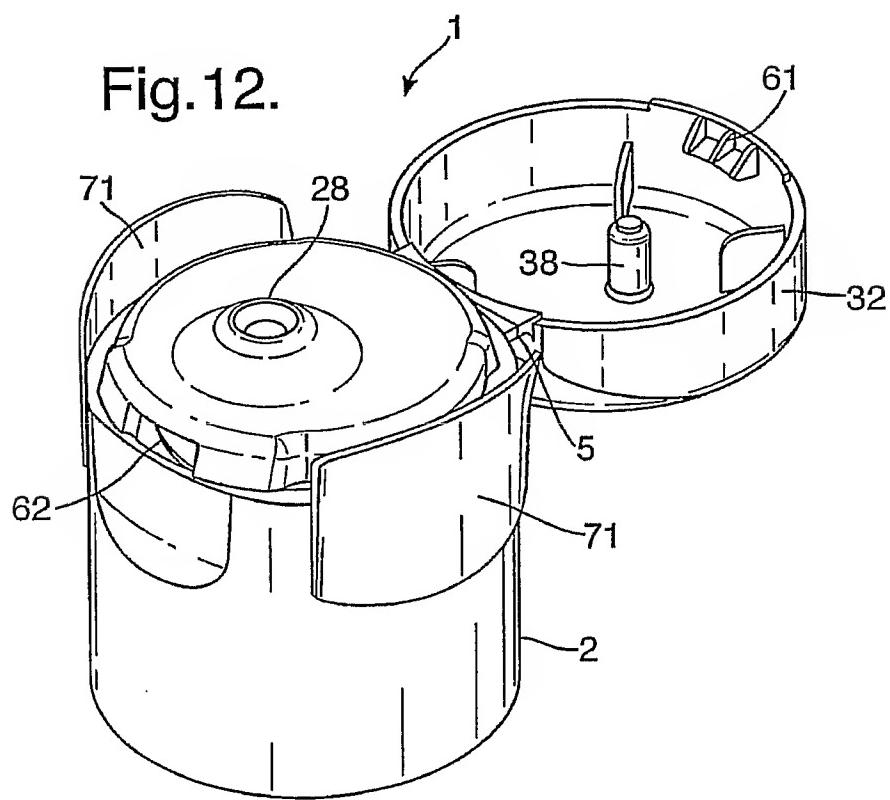


Fig.12.



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Fig.13.

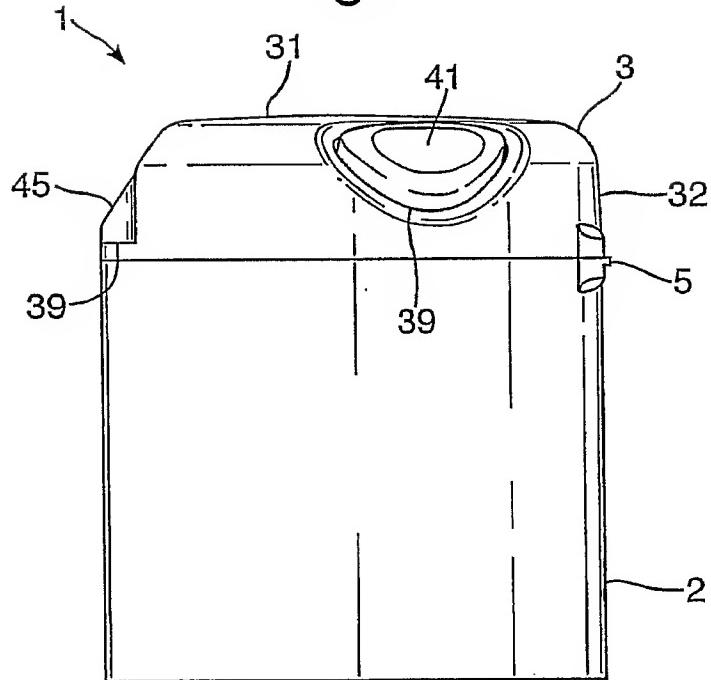
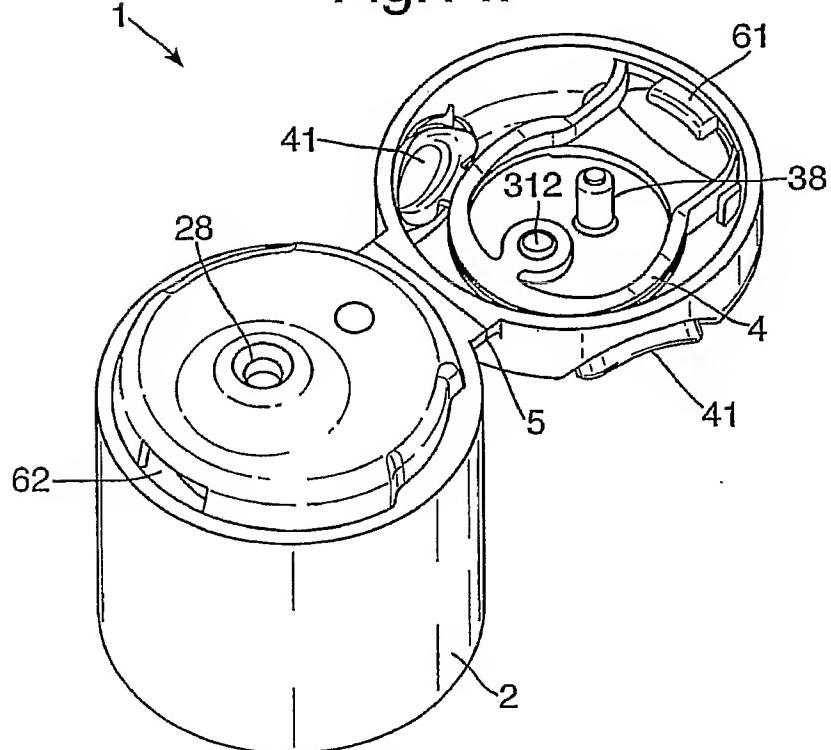
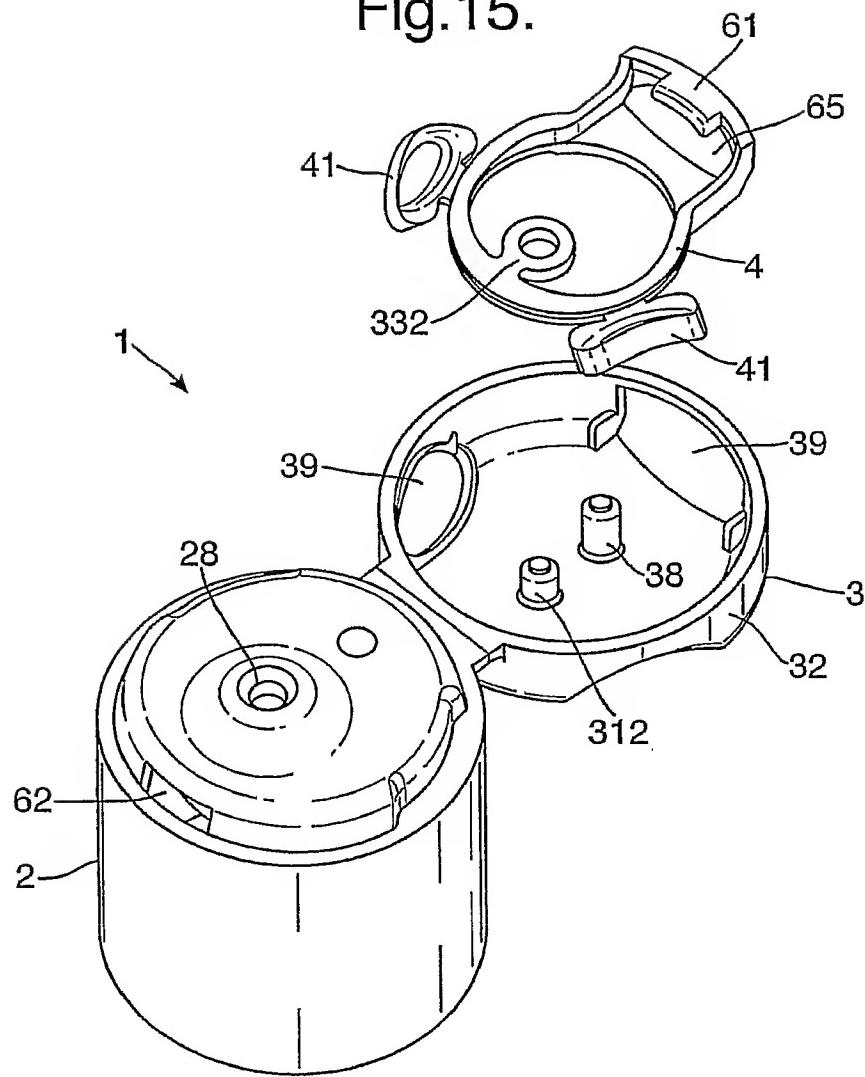


Fig.14.



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Fig.15.



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Fig.16.

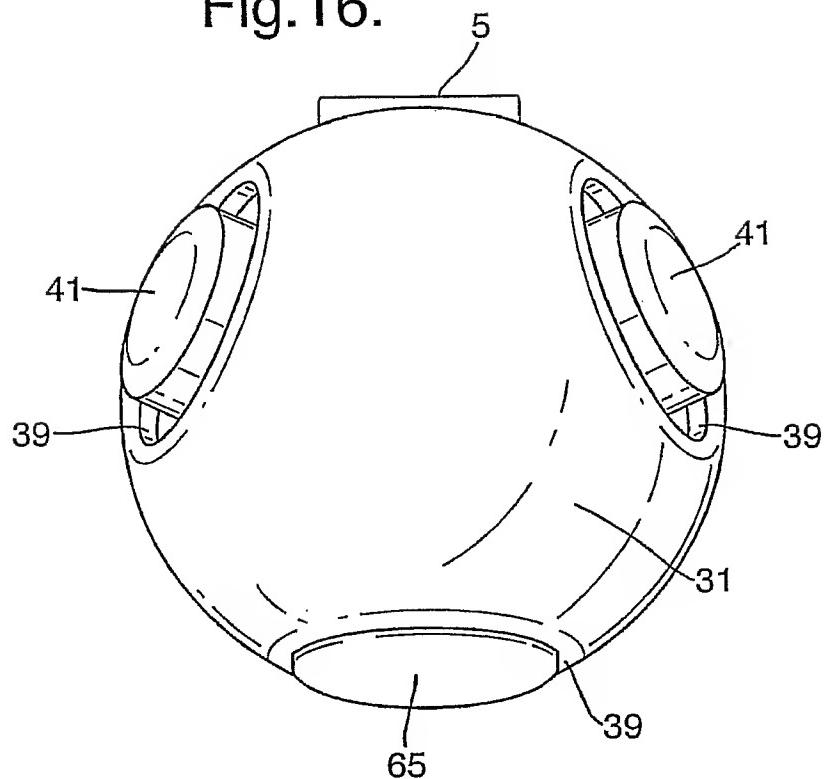
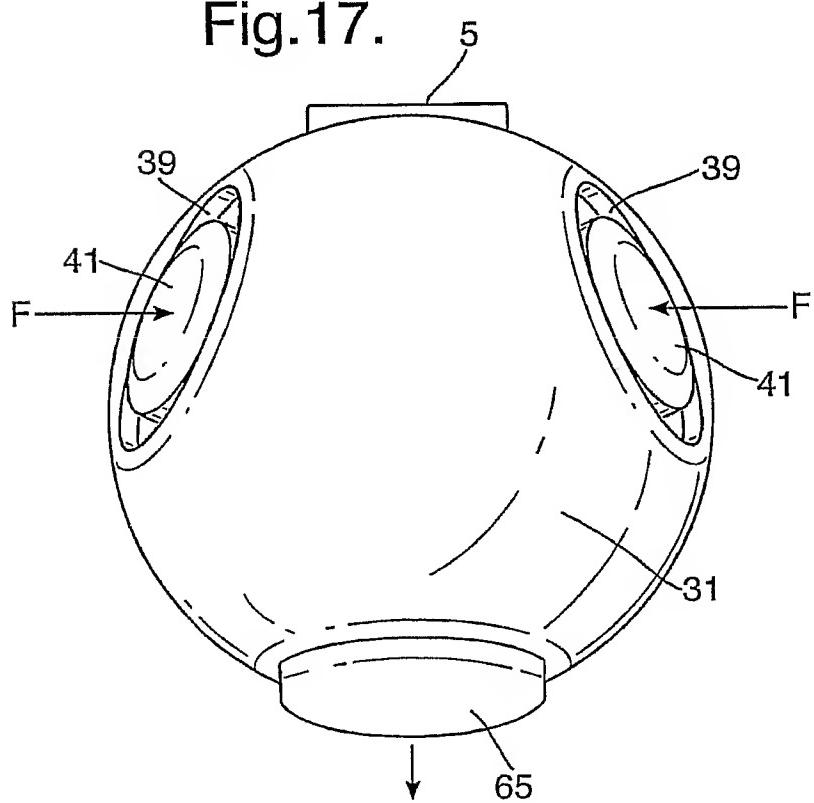


Fig.17.



## INTERNATIONAL SEARCH REPORT

International Application No

EP2005/053085

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 B65D50/04

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 1 484 517 A (NOVA HANDELS AG) 1 September 1977 (1977-09-01) page 2, line 48 - line 121; figures 1-6	1,2,6,10
X	FR 2 591 571 A (VEDDER & CO GMBH) 19 June 1987 (1987-06-19) page 2, line 31 - page 4, line 10 page 6, line 3 - page 8, line 4; figures 1-6	1,2,6,10
X	US 5 683 016 A (SANTAGIULIANA EVANS) 4 November 1997 (1997-11-04) column 3, line 11 - line 20; figures 1-4	1,2,6,10
X	US 3 603 470 A (ARMOUR DONALD F) 7 September 1971 (1971-09-07)	1,2,10
A	column 2, line 70 - column 3, line 6; figures 1-3	7
		-/-

 Further documents are listed in the continuation of box C. Patent family members are listed in annex.

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